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Pack It or Cull It?

By One Who Decides the Question Systematically

Production of bottles and jars by present day automatic manufacture involves, unavoidably, the discarding as cullet of a much higher per cent of the ware than in the old days of slower manufacture. A difference of but one or two per cent in the amount of ware culled when production reaches the immense quantities that are commonplace today, means much in the cost of the ware. Satisfying, or better yet, pleasing customers, means far more, on the other hand, than can ever be measured in mere dollars and cents. To pack and cull intelligently is a much greater problem to the manufacturer and to his customer, than either may, possibly, appreciate. At first thought, to pack and to cull may seem a simple operation and that all there is to it, is to pack the good articles and to cull the bad articles.

As mentioned, a difference of one or two per cent in the amount of ware culled from the large quantities today produced by machine manufacture means much in cost to both the manufacturer and the purchaser of these glass articles.

The closest co-operation between the manufacturer and the user of glass, particularly the packer, would be very helpful to each. If the glass container salesman, in most cases, had more intimate knowledge of the manufacture of the articles he sells, also of the product packed in such glass and the requirements to be met by the glass to best serve the fullest interest of his customer, then we would begin to get the most intelligence applied to the problem of what to pack and what to cull.

Here would seem to be the place for a "sure nuf" service man, a "trouble shooter." This live wire, who should be "one man in a thousand," must have been factory trained, of course, and well trained. He must know just how to go about deciding what the trouble is and what caused it. He must be able to prove his decisions correct, after making a satisfactory adjustment for the customer who was having trouble, when he returns to review every detail of that case with the superintendent. They, together, can then work out plans to guard against such defects getting out to the trade in the future.

This trouble shooter and the selecting and packing bosses of his organization should work hand in fist continually toward:

1. Pleasing every customer with every jar.
2. Packing every jar possible without taking a chance.

This matter of packing every jar possible without taking a chance is the whole "meat in the cocoanut." This includes the larger part of the problem, namely, the various uses of glass bottles and jars. It would seem like sense that the packer of shoe polish cannot, because of the necessarily low price at which he must sell his product, afford to pay an additional price for a quality of glass not necessary for the purpose for which he uses it. On the other hand, the packer of some food delicacy may find it just as necessary, from the very nature of his business, to get the highest grade of glass that his money can buy.

Packing and culling as it can be done by sight, has until just recently been the usual and the only practice. The necessity for such inspection is apparent, but sight inspection only will not satisfy for all the present uses of glass. Various tests must be employed and the wide awake manufacturer of today is seeking better means of making certain definite tests of his product before he packs it up for his customer.

Some of the tests, other than sight inspection, as now employed to determine vital questions are as follows:

The accuracy of batch formula.

The proper mixing of the batch.

The proper melting of the batch.

The thorough annealing of the glass.

The correct weight and capacity of the article.

The variation in height of articles. This latter test is becoming more necessary every day on account of the mechanical methods for filling, sealing and labeling glass packages.

There are in addition, necessary tests for the various kinds of caps and closures, the variations of which seem to be increasing each year.

There are also, sealing tests that should be made so that a manufacturer of glass containers may prove to himself, before he ships his ware that it will seal and stay sealed by whatever process of sealing the user of the glass may employ.

Accuracy of Batch Formula.—The importance of this

matter is amply testified to by the progressive glass manufacturer's attitude toward his scientific department consisting usually, of chemists and physicists.

This is the department to which the "sure nuf" service man goes for a solution of some of the new problems constantly put up to him, and, as industry intensifies, the more these problems will increase.

PROPER MIXING OF THE BATCH.—Some glass manufacturers now consider this matter so important that it is put under the supervision of the scientific department, and some surprisingly unique and simple means of current tests of the batch as mixed are being developed.

PROPER MELTING OF THE BATCH.—This work, also, comes within the scope of the scientific department. In fact, glass manufacturers are pursuing an entirely different policy at present than in the past, and the technically educated man is now considered necessary for the supervision of such melting operations.

In the last few years there has been a great development in the use of pyrometers, and today it is found necessary to currently test glass as it is being melted, and to know that the melting is giving the proper chemical formation to the glass.

In this connection, analysis of the glass itself, taken from articles after they reach the packing room is frequently made at the laboratory, so as to get proper information and guidance in the matter of batch formula.

In plants that are striving to show the greatest accomplishments in glass manufacture for the benefit of their customers, particularly where the packing of food is involved, the manager of the selecting department, commonly called the Selection Boss, is expected to know a great deal about the operations at the laboratory, and to be on the lookout for the appearance of any difficulty in the glass he packs or culls, that may need the attention of the scientific department.

The Selection Boss should conduct various tests such as:

Boiling water test.

Polariscope or strain finding test.

Tests for capacity and weight.

Height gauge test, finish gauge test and sealing test. These particular tests come specifically under his jurisdiction.

THE BOILING WATER TEST.—Every two hours (that is, four times every "turn" of eight hours,—of 12,000 to 20,000 jars made per turn), forty or more jars should be set out on a wood topped table and each jar poured practically full of boiling water. A few customers pack their goods cold ("trouble shooter" knows) and, of course, it is not so important that their ware stand up as well under this test. But for each kind of jar and for each customer should be set a certain per cent which breakage in this test must not exceed or ware will not be packed until two successive tests show breakage to be back under that per cent again. This test must be made much more frequently in times of trouble of that nature.

THE POLARISCOPE TEST.—The polariscope or strain finder machine is of undoubted value as an instrument by the use of which we are able to grade ware systematically on the basis of how free each jar appears to be from cords and strains. These grades are valuable signals to those that have to do with mixing, melting, making and annealing. Three bottles should be graded from each lehr (left, center and right) every four hours.

TESTS FOR CAPACITY AND WEIGHT.—Every time a job goes on a machine, one jar from each mold should be weighed and graduated for weight and capacity. Subsequent to that, the same thing should be done every time to the jar affected when any change is made in equipment. Trouble shooter will know how much variation from standard each customer can and will stand for.

HEIGHT GAUGE TEST.—With the mechanical capping, sealing and labeling methods of today, users of jars can stand for but very little variation in height. The selection boss should be equipped with a height gauge, having an "over" and a "not-over" side for each style and size jar. He should have one jar from every mold tried by this gauge every eight hours, and the jar affected, every time any mold equipment is changed. He must not pack what will not take the gauge. This test can be made on unannealed but cooled ware for machine operators' guidance.

FINISH GAUGES AND CAPS.—Dimensions for these gauges are prescribed by the Glass Container Association and the finish of one jar from each mold should be tested by these gauges and by the cap to be used every four hours or oftener and none packed that aren't O. K. Factory people can make the same tests on unannealed ware and be guided by what they find.

SEALING TEST.—The selection foreman should be equipped with devices for sealing any kind of cap and should actually seal one jar from every mold, full of water, every time a run of that style of jar is made, put his sealed jars away, labeled and observe them later. This test will determine what may be safely passed, in the line of edge blisters, etc.

All these suggestions, if carried out, will be but one step along the line of definite and rigid high standards in one department of the greatest game in the world, making better glass containers. Such standards will work to the advantage of packers and manufacturers alike.

Manganese Ore Used in Making Glass

Before the war, the ordinary specifications for manganese ore used in glass making were 85 to 90 per cent manganese dioxide and less than one per cent metallic iron. Outside of these two ingredients, each manufacturer has his own requirements. Special glasses may require ore carrying more than 90 per cent manganese dioxide and less than 0.5 per cent iron. The higher the manganese content and the lower the iron, the better the ore is for glass making. In general, the grades of ore are similar to those used in making dry cells. Obviously, siliceous manganese is not objectionable, but carbonaceous manganese is.

Manganese ore for glass making is sold in powdered, granulated or lump form. There are objections to the lump form because of the time required to melt it into the batch. Powdered ore is used principally when the batch is melted in pots; lump, or granular ore is used when melting is done in tanks.—*From "Double-S-Fax," published by The Sharp-Schurtz Company.*

The Application of Calorizing to Glass Making Processes

By S. FRANK COX*

Perhaps it would be well to define calorizing, in case any readers are not quite familiar with the term. Calorizing is a heat treating process, patented by the General Electric Company, in which aluminum is driven into steel or iron so that on exposure to heat, an aluminum oxide protective coat is formed. In other words, calorizing is a method of protecting metals against heat action. A detailed description of the process itself is not included here; the reader is referred to recent technical publications on the subject.[1]

In the process of calorizing, the metals treated become coated with a tightly adhering coat of aluminum oxide, which is continuously self-renewing by virtue of the oxidation of aluminum as the initial coating is worn away.

It is recommended for use in temperatures up to 1700 degrees Fahrenheit, under continuous service, and will also give satisfactory service where the temperatures are intermittently higher.

Most applications of calorizing mentioned in the discussion embody the use of steel and occasionally cast iron, or other metals, but to a far less extent than steel.

The applications of calorizing to glass manufacture may be considered under three heads:

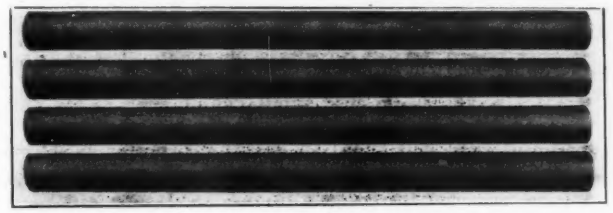
1. Melting furnaces.
2. Glass fabricating devices.
3. Annealing furnaces and lehrs.

1. Under the head of melting furnaces, two successful applications have so far been made: A. For burners on tanks and furnaces using natural gas. Slight variations in the orifice of a gas burner will cause great variations in the furnace behavior. The burners of a tank using natural gas will run hot or cold as the stack is carried low or high, and this is varied in turn to suit the behavior of the batch in the melting end. A calorized burner is practically no additional expense, and gives assurance that the trueness of the burner orifice will be maintained for a much longer time, even in the face of a low stack, and a hot "sting out." B. The writer's first acquaintance with calorized steel was in its application to supporting members for clay parts, with which use every glass furnace builder is concerned. In the form of rods and eye bolts, it has been used to support dampers, kiln covers, and similar devices.

Glass working temperatures vary widely with the process and type of glass being worked, but will run ordinarily in the neighborhood of 2000 degrees Fahrenheit. Steel parts used to support clay members over or around a pool of glass at these temperatures will ordinarily not exceed 1700 degrees Fahrenheit, and it is here that calorizing has a direct and positive application. It definitely increases the life of steel parts, protects the glass from the bad effect of iron oxide scale, and keeps the clay parts in better alignment. Cases have come under observation where, in case of failure of the clay parts and exposure of the steel supports to the direct cutting action of the fires, the protection afforded by calorizing the support rods was sufficient to allow of clean removal of the failed part, whereas an uncalorized support would have burned completely apart and caused no end of trouble in the removal of the clay piece.

In the permanent furnace structure calorizing finds application to structural shapes supporting sidewalls, skewbacks and the like. Cases of severe oxidation of angles, channel irons and rods have been observed in the furnace structure proper, where calorized parts would have produced far better results. The additional expense due to any of the applications mentioned is so slight in comparison to the cost of furnace construction and maintenance, as to offer no serious obstacle to taking advantage of the improvement that is afforded.

Of the actual heat input to a glass melting furnace, only a very small part is utilized in performing useful work. Several publications giving heat balances show exact figures



CALORIZED FLUE TUBES FOR GLASS FABRICATING MACHINES

of the various losses.[2] Loss due to radiation is considerable, and can only be lessened by the use of the so-called "super-refractories" which can be backed up with insulating material, and which are sufficiently refractory to withstand the increased temperature which this induces on the interior face of wall or cap.

Regeneration, as at present applied, has of course been a standard practice for years. Of late, we hear much of recuperation as compared to regeneration. It is undoubtedly a much more efficient method of fuel economy, where it can be applied. In regenerative furnaces, we depend upon the heat absorbing power of brick work. Exit gases from the combustion chamber give up their heat to brick work in the checker room, which in turn, when the direction of flow of the gases is reversed, gives up its absorbed heat to the incoming air or gas.

How important a part this interchange plays in the combustion process needs no elaboration to any one who has ever wrestled with "cold checkers." A certain part of the heat of the flue gases is saved by regeneration, and returned to do useful work. A much greater saving with a directly lessened fuel consumption is offered through recuperation.

Recuperation involves a flow of gases in one direction only. This is of advantage in bringing a furnace to balance, and of great benefit in maintaining that balance. It affords an efficient heat exchange between outgoing and incoming gases, without the necessity of reversing. The fundamental principle is doubtless familiar to all glass furnace men. Incoming gases are passed through pipes or

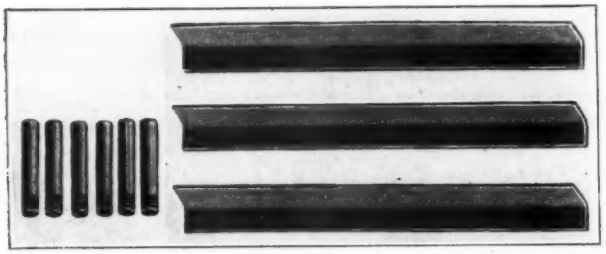
*Chief Engineer, Calorizing Company of Pittsburgh. Recently Assistant to Consulting Engineer, Pittsburgh Plate Glass Company.

[1] *General Electric Review*, May, 1922. *Iron Trade Review*, June 23, 1921. *The Iron Age*, January 27, 1921.

[2] THE GLASS INDUSTRY, Vol. 3, pp. 151-153 (August, 1920).

tubes over which the outgoing gases flow, and with which they are in intimate contact. The heat transfer takes place through the walls of the tubes.

To afford the greatest heat efficiency, these tubes must be of highly conducting material. To be practicable, they must be of material which will stand the temperatures encountered and which will resist temperature changes incidental to shutting down a furnace, or to cycles in the furnace operation. To the writer's knowledge, calorized tubes have not as yet been tried on either glass melting or glass annealing recuperative furnaces. They would certainly be successful on the latter. As regards their usefulness on the former,



CALORIZED GAS BURNER TIPS, PYROMETER PROTECTION TUBES AND STRUCTURAL SHAPES FOR GLASS MELTING FURNACES

experiment alone will afford an answer. It is interesting to note, however, that they have been successfully applied to the preheating of air on both high and medium temperature furnaces in other industries, with a consequent direct saving in fuel of from 16 to 25 per cent.

It is not altogether beside the point to theorize a bit as to the possibilities of recuperation compared to regeneration, in glass melting furnaces. The glass maker, along with other users of fuel, will find his fuel costs an increasingly greater burden, and can afford to ignore no possibility of lessening that burden. The increased efficiency of fuel used will come in part, no doubt, from an increased and more accurate knowledge of port, checker room, flue and melting chamber dimensions and arrangement, but a way is also pointed out in the direction of change in fundamental principle, and consideration of the possibilities of recuperative furnaces cannot be ignored.

In connection with the operation of glass melting furnaces, raw producer gas is coming to play an increasingly greater part. The same is true of washed gas on the lehrs. Interruption of service on the producer plant or lines, due to burnt out metal parts, detracts materially from efficiency and economy of operation. Some parts of the gas plant lines for which calorized parts might well be considered, are:

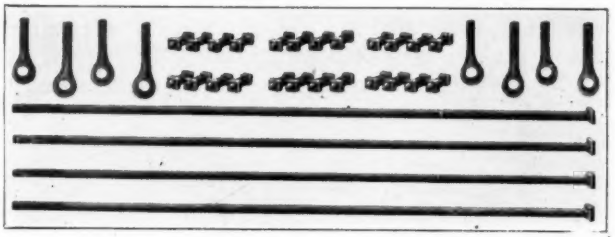
Valves and valve stems, burn-out damper covers and damper stems, stack or flue dampers, blowers for removing carbon from raw gas lines, and gas reversing valves on furnaces.

2. With the application to glass fabricating devices, a more difficult problem is met, due to the fact that these parts are usually in the form of castings of more or less intricate design. Methods of calorizing such parts are being perfected to the point where they are normally very successful, affording increased life of the parts and freedom from glass discoloration by the minimizing of scaling.

These applications have taken a wide variety of forms. Where the parts are steel, or cast steel, the calorizing operation is well under control and the results are uniformly satisfactory (the parts disassembled and then cleaning up threaded parts and reassembling). With cast iron parts, deformation or warpage occurs in a small number of cases, but this is being brought under control so that success may be assured.

In this case it might be well to point out that careful experiments show that aluminum-bearing metals, such as calorized steel or cast calite parts, offer the maximum resistance of the action of glass. The reason for this resistance is due to the presence of oxide of aluminum which is more nearly allied in its nature to glass than any metal oxide encountered in the usual resistant alloys.

The writer has observed cases where the accidental dropping of an iron or steel part into the glass body has caused a great amount of trouble, by action of glass on the iron causing blister. A calorized part would certainly lead to much less difficulty in this connection. Whether or not it



CALORIZED BOLTS AND ACCESSORIES FOR SUPPORTING TOP STONES

would insure positive protection cannot be stated. To digress a moment, it is a peculiar fact that iron parts dropped into glass do not inevitably cause trouble, as the writer has seen bolts removed from a glass body on which the threads were intact and no attack had taken place. Cases have also been observed where a working kiln has been spoiled for days by iron.

One would certainly not care to recommend that all metal parts which work out over open glass baths should be calorized, but such parts which are from their position particularly liable to work loose and get into the glass, could well be so protected, not only for the above reason, but from the standpoint of the greater life obtained.

3. In connection with the third application, that to lehrs or annealers, the points above made with respect to burners on melting furnaces will also apply here. Metal parts in lehrs, in the hot ovens particularly, could in certain instances be calorized profitably. The same is true of structural members used in the furnace walls.

All pyrometer protection tubes, through the course of the lehrs proper, should be calorized. Increased life more than justifies the small additional expense. The value of thermocouples for temperature control aside from the accuracy of equipment is partly a matter of the fixed location of the element. Once an element is placed, and the furnace operation is standardized to that location, the longer that element is undisturbed the more satisfactory the operation will be.

The application to any glass manufacturing operation will

necessarily be dependent upon the value of the part to be protected and the condition under which that part is used.

The above applications are pointed out only as an indication of the methods of attack on the problem and to show the sort of problems in glass manufacture in which it is known that calorizing can be of material assistance.

The Re-Annealing of Glass*

By W. A. WHATMOUGH, B.Sc.

It is thought that the members of the Society of Glass Technology would be interested in the results of three years' experience of re-annealing small glass articles on a commercial scale in a coal gas-fired lehr of peculiar construction. Hence this paper.

Although scarcely necessary, it is perhaps advisable, in the first place, to emphasize the distinction between annealing, as ordinarily understood, and re-annealing.

Annealing by the slow cooling of glass is in common practice in the glass-house. Usually the worked article is passed through a coke-fired or producer gas-fired lehr more to prevent development of strain through rapidly cooling than to re-heat sufficiently to release stresses already present.

The re-heating of glass to its softening point is characteristic of re-annealing, and calls for an exactitude of temperature and regulation of rate of heating and cooling not attainable in ordinary lehr practice. The novelty in the communication now made is that a method of re-annealing has been evolved in which the temperature curve, time of exposure, and cooling rate are definitely controlled, so that commercial annealing takes on a new and more scientific phase. Accordingly, in this paper, reference to an article as being annealed must be understood to mean that it is completely free from strain.

It should be borne in mind that strain in glass is not an inevitable cause of fracture. Indeed, the article may be all the stronger in consequence of being under stress. The real trouble is that strained glass is capricious as regards fracture, especially when stressed unevenly. Change in the state of strain due to causes such as the alteration of temperature or of pressure increases the tendency to fracture. Local strains may become so intense that breakage must ensue. Cracking off because of ring strain is an example of this. Breaking at joints and the splitting of canes of glass longitudinally are other strain effects.

The type of glass has also an important bearing on the effect of strain. Boro-silicate glass, which is difficult to anneal, nevertheless withstands temperature changes well, owing to its low coefficient of expansion. Lead glass is easily annealed; hence one of the reasons for its popularity in lampworks. Stressed glass is undoubtedly the greatest cause of loss in the manufacture of glassware, and cases in which it is advantageous not to anneal are rare.

Articles of thick glass retain enough heat to prevent strain forming during working, but they must be cooled slowly or fracture is inevitable. Small and relatively thin-walled glass articles withstand chilling in the mold or during air cooling without breaking, but are badly strained and liable to fly, especially if re-worked. Glass tubing, after being drawn in the glass factory, is air-cooled and almost invariably shows marked longitudinal strain, since no attempt is made to anneal it. When the strain is patchy it is practically impossible to cut evenly with a diamond the ordinary chemical sodium-calcium glass tubing, but lead glass is much more amenable.

Being interested in the manufacture of small articles from glass tubing, the author soon found that production was largely governed by the time taken in warming up the glass and in some attempt at bench annealing (carbonizing, etc.) after the lampworking operation was complete. If tubes are rotated quickly on machines, the liability to fracture is lessened considerably on warming up, but some breakage may arise on cooling due to localization of the heating and cooling effects leading to ring strain.

This ring strain is the prime cause of fracture in flat bottom specimen tubes. In hand-made tubes the "ring" strain is usually about a quarter of an inch from the flattened bottom, but may be more or less diffused according to the spread of the flame up the tube in working and also according as the tube was or was not slowly cooled.

The introduction of machines for slicing an open tube into two flat bottom tubes by means of high velocity burners was found to result in intense "ring" strain one-eighth of an inch from the end of the flat bottom tube. A large proportion invariably cracked off neatly, and this nuisance was only partly mitigated by warming the tube and the rollers on account of the great speed of working. It appeared, necessary, therefore, either to reduce production or to remove the strain by re-annealing.

By the use of various expedients it was found that speed of working could be maintained with little breakage as long as the tubes were re-annealed within a few hours. Subsequently it was found possible to increase the speed of production and lengthen the period before annealing to days or weeks, but by this time the advantages of re-annealing had become so self-evident that it had become routine practice at the works. . . .

THE DESIGN OF THE RE-ANNEALING LEHR

At the outset it was realized that draughts or any bodily movement of air inside the lehr would be fatal to success, and this led to the adoption of a tunnel lehr in the form of an inverted siphon (Fig. 1), with the entrance, at the short leg, lower in level than the exit at the end of the long member. This form of lehr is protected by a patent. . . .

The feeding of hot combustible products under pressure to a lehr tunnel on the inverted syphon principle with a lowered short limb (to entrap gases at the entrance end) results in a steady flow of heat outward along the long leg of the

*J. Soc. Gl. Tech., 1921, 17, 44-54.

syphon. The entrance end was screened to avoid bodily transference of the lehr atmosphere. Furthermore, the re-heated trays of articles conveyed heat from the firebox along the long leg. The heat gradient was governed by the gradual loss by radiation (controllable by suitable lagging) or the temperature was reduced at any desired point by letting off a portion of the hot gases. Radiation losses at high temperature are very excessive if brickwork only is used as insulation, and this has a vital bearing both on the annealing and on the gas consumption, as will be very evident later.

At the time this experimental lehr was built the results of the researches of English and Turner[1] were not published, although the author knew of their trend in a general way. The Department of Glass Technology at Sheffield University was good enough to test the two types of glass in use by my firm in 1917, these being a boro-silicate resistance glass in which strain was rapidly removed at 630° and soft soda chemical glass softening at 530°.

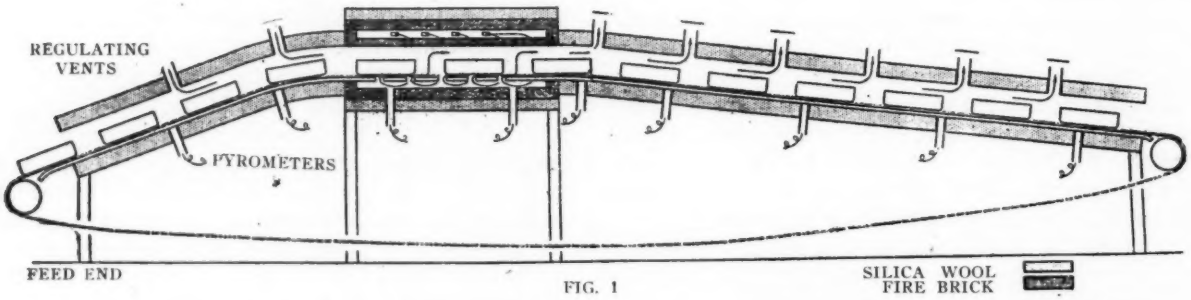


FIG. 1

The Curve X (Fig. 2) gives the re-annealing curve of the latter glass with the experimental lehr as first set up, the lehr being cleared in one hour. The actual results obtained were perfectly satisfactory, with tubing of 1 mm. wall, but 1½ walled tubing required two hours to re-anneal. In the original experimental lehr it was soon evident that much heat was lost through the outer wall of the firebox, and also from the brickwork at the hot end of the cooling leg. Accordingly, the firebox was lagged with several inches of slag wool, and 3 feet 6 inches of brickwork next to the firebox was removed and slag wool substituted, the new lagging being held in place by sheet metal. The result of this extra lagging is shown in Fig. 2, Curve Y, for the same sodium-calcium glass (under like conditions except extra lagging). The rate of cooling is considerably slowed at higher temperatures. In consequence, tubing 1½ mm. wall is re-annealed perfectly in one hour, as the effective annealing length of lehr is increased by about 33 per cent solely by the conservation of heat. Undoubtedly many annealing lehrs have a useful length much less than their actual length.

A lehr[2] with a tunnel 19 inches square was designed as the result of two years' experience. . . .

Fig. 1 illustrates the essentials of the new lehr.

Fig. 3 shows three temperature curves for this lehr as set to the users' specification. This type of lehr has been in use for some months past to anneal the glass portions of electric light meters. This glass part consists of a bulb containing a grid of glass attached to a tube enclosing a siphon, and has several delicate internal joints. The unannealed article shows intense local strains, and, prior to re-annealing, breakages in different stages of working resulted in more than 50 per cent loss on production. The thickness of the stoutest part is 1½ mm., whilst the most delicate portions are very thin. The article is now re-annealed in various stages of manufacture, and finally re-annealed with the end closed. The loss by breakage during making has been completely eliminated, the manufacturers stating, to the author's astonishment, that no breakage occurred in re-working. No doubt this result was obtained by a combination of perfectly annealed glass and of low coefficient of expansion.

The lehr is capable of taking many times the day's production of meter tubes, so that each day's work (partly or wholly completed) is put through in a morning of four hours.

Attention may be directed to the gradual period of initial warming, and the rapid rise of temperature after the moisture has been converted into steam. Further, the tray is practically cold on emerging from the lehr. As the tubes are surrounded with asbestos fibre, the heating up and cooling down of the articles lag considerably, as explained later. It is also curious that perfect annealing is effected more than 80° below the softening point (630°).

It is, perhaps, scarcely realized what high temperature glass will withstand without collapsing. At 530° a naked iron tray of specimen tubes traveling through the firebox begins to show color, and finally both tray and glass attain a dull red glow, being hottest just after passing beyond the region of the burners.

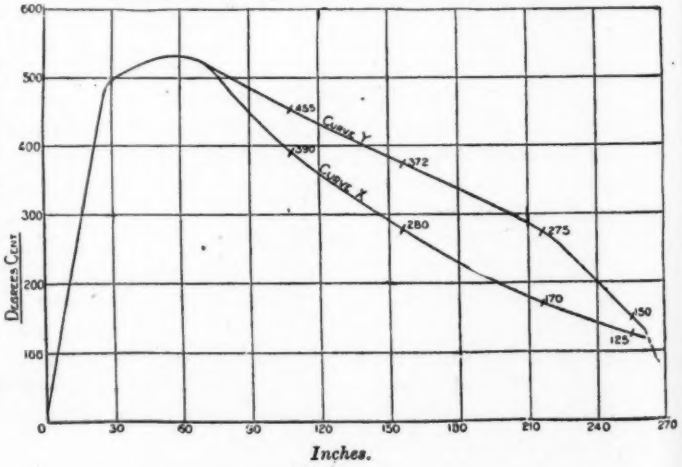


FIG. 2.

[1] *Trans. Soc. Gl. Tech.*, 1918. 2, 90.

[2] This lehr was described in THE GLASS INDUSTRY, March, 1921, p. 77.

In re-annealing resistance glass at 625°, the bright red color of the box and contents is a pretty sight, and the changes of color as the temperature falls to a black heat testify to the remarkable uniformity in the heat gradient. One would also expect the angle iron of the track and sheet metal to burn away at such high temperatures. The original lehr was, however, continuously at work twelve hours a day for six months at 630°, with no visible effect beyond slight "Barffing" of the metal work (coating with red oxide of iron). The inert atmosphere no doubt accounts for this passive non-rusting condition. The conveyor chain (malleable iron) withstands the temperature of 650° without undue stretching.

The effect of the burner position is best seen in the gas consumption. The 9-inch lehr can be heated to 550° in half an hour with four burners consuming in that period 140 cubic feet of town gas. The original lehr was found to take

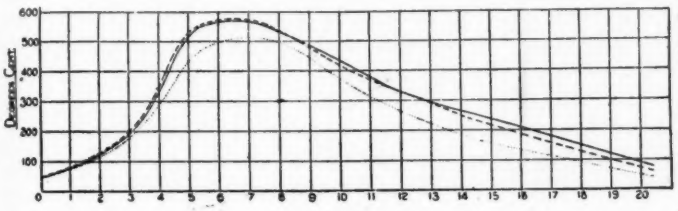


FIG. 3

two hours to heat up and consumed 480 feet of gas in the process. The effectiveness of the lagging is shown by the fact that after twenty hours' standing the temperature in the firebox had fallen to 160°. Once the desired temperature is attained and the burners are adjusted, there is little or no variation in temperature, rise or fall being very slow and readily checked or increased. Running the lehr empty or full has very little effect on the gas consumption.

THE CONDITIONS REQUIRED FOR ANNEALING

The author considers that the critical annealing curves of glass as worked out by English and Turner (*loc. cit.*) is of the utmost value as regards carrying out rapid re-annealing. Such a curve shows the maximum cooling rate (as temperature falls) without strain reappearing. If the lehr temperature follows such a curve, the minimum period of transit is only a question of thickness of the glass.

Cooling curve Y in Fig. 2 gives the quickest possible rate of re-annealing soft soda glass 1½ mm. thick as found by actual practice without a knowledge of the correct cooling curve for this particular glass; but from a comparison with other known curves the best lehr temperature for rapid re-annealing is identical with the critical cooling curve of glass. In other words, the remarkable success following our venture at re-annealing is due to the fact that it happened to put into practice the conditions laid down by the Sheffield researches.

The effect of temperature gradient and the cooling rate are shown in Fig. 4, the results below being obtained on soft soda tubing with 1½ mm. wall:

Curve X_1 (one hour in original lehr). Longitudinal strain present; cooling therefore too rapid. On packing in asbestos fibre, re-annealing perfect.

Curve X_2 (two hours in original lehr). No strain.

Curve Y_1 (one hour in original lehr with extra lagging). No strain.

Curve Y_2 (two hours in original lehr with extra lagging). No strain.

Packing the glass in asbestos reduced the loss by radiation, and thus lengthened the effective cooling curves. This is evident from the results. The temperature gradient of Curve X_1 is raised at least to that of Curve Y_1 for the glass in question solely by insulation. Hence the use of asbestos mats in lehr trays as a corrective to too rapid fall of temperature is to be recommended.

In practical re-annealing the author finds that the usual acceptance of the factors governing annealing must not be interpreted too rigidly. Thus, the annealing temperature of glass is understood to be that at which strain is released rapidly without deformation. Actually, when glass is sufficiently soft for strain to be released in a few minutes deformation takes place, but so slowly as to be negligible. When, however, a thin portion of glass has to carry the relatively greater weight of a thicker portion, re-annealing must be carried out for a longer period at a lower temperature. The effect of gravity is noticeable in flat-bottomed tubes heated up to the annealing temperature. If placed upright, the bottoms become slightly concave, but are not affected when the tubes lie on their sides. Collapse follows if heating is too prolonged

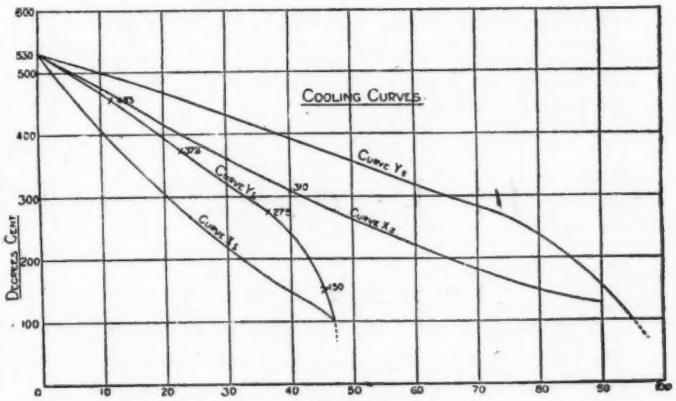


FIG. 4

at re-annealing temperature, and this latter temperature is dependent upon the type of glass, its thickness, and the period of heating, not necessarily at the annealing temperature. It may be 20° below this for very thin glass, or even more if thin glass has to carry weight. In the latter, advantage must be taken of the well-known fact that annealing can be carried out many degrees below annealing temperature, if sufficient time is taken. Fractional re-annealing is also possible; thus, an article passed through the lehr twice is annealed perfectly at a temperature 20° or 30° below that necessary for annealing in a single transit.

The maximum rate of cooling glassware in order to obtain perfect annealing is dependent upon the conductivity and the viscosity of the glass.

Conductivity regulates the temperature gradient; no strain can be developed if the temperature through the mass is the same. Glass being a relatively bad conductor of heat, the effect of thickness is very evident both in reheating and cool-

ing. The time for strain release is controlled by the rate of penetration of the heat as well as by the actual temperature. Thus, it is possible to heat a thick article well over the annealing temperature for a short period, as the inner portion of the mass does not get sufficiently soft to allow collapse.

Interpreted into everyday practice, the quickest possible rate of re-annealing an article is controlled by three conditions, namely:

(1) The thinnest portion of the glass governs the highest temperature to which it can be taken with safety (usually 5° to 10° below the annealing temperature unless it carries undue weight, when it must be still lower).

(2) The thickest portion governs the time required for the release of strain (varies according to proximity to the annealing temperature).

(3) The thickest portion controls the maximum cooling rate (that is, most rapid annealing is only possible if the lehr temperature follows the critical cooling curve).

Thus the characteristics to be decided in re-annealing any glass article are the maximum temperature and the temperature gradient of the lehr. With these known, the minimum clearance time is quickly found by trial. The minimum clearance time for the experimental lehr with the temperature gradient as Curve Y, Fig. 2, for glass of fairly uniform thickness, and temperature 5° to 15° below annealing temperature, is as follows:

Thickness of wall	Time
Up to ½ mm	¼ hour
½ mm. to 1 mm	½ hour
1 to 2 mm	1 hour

The author has had very little experience with thicker articles, but knows that bottle glass (for example, a Winchester quart bottle with a bottom 4 to 5 mm. thick) is annealed perfectly in four hours at 540°. On this basis the time for ordinary bottles would be from three to four hours.

The ultimate capacity of a re-annealing lehr is dependent upon its cross section, track length, and the time taken in clearance. If such a lehr, by closely following the critical annealing curve, allows an article to be annealed in half the usual time, its capacity is relatively doubled. Hence the importance of determining this annealing curve of glass and setting the lehr according to it.

Attempt to shorten the time of cooling beyond this rate, as in much so-called "commercial" annealing, are bound to be disastrous. Annealing is brought about by sufficiently slow cooling, and if strain begins to reappear it is a sign of undue haste. If it takes sixty minutes to produce an article perfectly annealed, it is a waste of time and good material to take forty-five minutes in spoiling it. Blooming is exceedingly slight in articles of resistance, soft soda, or bottle glass re-annealing naked. Lead glass begins to blacken badly at the annealing temperature, but is readily annealed 10° below this with a greyish bloom. Enclosing the articles in boxes keeps lead glass practically clear. The position of the burners in the experimental lehr did not allow excess air to be used owing to "blow back."

Bead Making at Murano and Venice

(Concluded from November issue)

ROSETTA WORK OF FRANCHINI

If the fondant is not cupped, but is pulled out in a solid rod instead of into a tube or cane, a cross section of that rod (not its surface) will reproduce any pattern desired. Indeed the pattern may be made with rods of cold glass so stacked that their ends form a mosaic. They are then fused to the point of ductility, but not of liquefaction, and even if drawn out to the thickness of a needle a cross section will show the complete pattern. Glass for mosaics (used also for African and mosaic beads), showing patterns of stars, flowers, and geometric designs, is made in that way, and each clipped segment of the rod shows the pattern on its face.

In the first half of the last century Jacopo Franchini, perhaps the most remarkable glassworker Murano has produced, by binding tiny straws of colored glass together formed at the end of the rod a miniature portrait or other design. This combination rod was then fused at a blowpipe and drawn out until a rod no larger than a knitting needle might be cut into cross sections, each one of which would show a perfect portrait or perfect design. In the Murano Museum there is a section of glass rod less than 1 centimeter (centimeter = 0.3937 inch) in diameter that shows three perfect portraits side by side, or, rather, in clover-leaf arrangement. Owing to his intense application to so painstaking a work Franchini died in a madhouse, and nobody has since been found who can duplicate his work in glass, although several attempts have been made.

By the courtesy of Cavaliere Arbib a small collection of Franchini's work is transmitted with this report. [This collection has been placed in the National Museum at Washington.] It includes small portraits in glass of Garibaldi, of King Victor Emmanuel, of Count Cavour, and of the three together, including the clover-leaf triple portrait described above—the smallest group of portraits in the world. The exhibit has also a portrait of Emperor Franz Josef in the year he ascended the throne, of a lady said to be the sweetheart of Franchini, of the Rialto Bridge, of a gondola, of a cat, of a skull, and a number of flower and figure designs. The design originally ran the entire length of the glass rod and each disk clipped preserved it perfectly. Such disks can be used as mosaics in the making of handmade beads or combined with goldstone to make flat surface brooch designs, a sample of which is included in the collection.

MOSAIC BEADS—MALE AND FEMALE LABOR

Mosaic beads intended for African and other wild tribes are properly classed with handmade beads, but as a small section of the "canna" is always or nearly always used as the base a description of their manufacture is included here.

These beads are not spherical, as pieces from one-half to 2 inches in length are clipped off the canna. These are then fused by blowpipes at Bunsen burners, and mosaic beads are pressed into the surface to give the desired pattern and fused to the point where they coalesce but without losing shape. These long beads with snakelike mottlings and markings are then ground to a smooth surface, strung, bunched and packed for shipment. Such beads are really individually handmade, although they can be made to set patterns very quickly. Few of these beads go to America, although they might easily become a fad there. Nothing but the canes for these beads are made at Murano; all the other work is done at the Venice plant of the society. The foregoing covers all the varieties of beads made at Murano. There are certain types of beads, each individually handmade, ornamented, and enameled at the blowpipe, showing surface patterns of roses and other flowers and designs that are made exclusively at Venice by expert workmen.

In the making of beads in bulk the fondant is mixed, melted and molded by men, and men do all the furnace work and the making of the canes. Men also sharpen the axes of the clipping machines, but the greater part of the detail work of bead making is done by women. Women operate the clipping machines, sort the beads, sort the canes, operate the machines that string the beads on wires, do the work of stringing on thread and of bunching the beads, do most of the work of preparing the beads for shipment, work at the blowpipe in making and also grind the African beads, and do nearly all the work of manufacture of bead articles. They are paid by the piece and can increase their wages by expertness. At the Murano factory the Società normally employs about 1,000 families on bead making. A woman's wages vary between 1 and 6 lire per day according to her skill and speed.

History of Venetian Glass and Bead Making

Perhaps the best work on Venetian glass making, including bead making, is by Angelo Santi, director of the museum at Murano and of the journal, La Voce di Murano (now no longer published, which contains some excellent historical articles on glass making). Copies of Mr. Santi's book are no longer available except in libraries. It is entitled "Origine dell'Arte Vetraria in Venezia e Murano; Suo Rissorgimento e Progresso, Cenni Storici" (Origin of the Glassmaking Art in Venice and Murano; Its Renaissance and Progress). A very limited use of this book has been made in this report. All the processes of bead making are described from visits to the factory under the hospitable guidance of the management.

From the above-named book much of the following information as to the historical origin of bead making is condensed.

"Margarette" or "conterie" were known to the Egyptians, and there are in Murano and Venice several specimens of Egyptian mummy beads, some of them so small as to weigh only 0.93 grain, known to date from 1100 B. C. It is possible that the first Venetian makers came from Byzantium, and mosaic makers are known to have been called to Venice when Byzantium fell.

Paternostri from Rock Crystal

The first Venetian beads seem to have been made by artisans in rock crystal, after which the glassmakers of Murano imitated the beads from natural quartz by perfect counterparts in glass. These were for religious uses in prayers and were called "paternostri." The glassmakers who manufactured them had the special name of "paternostrieri" and were afterwards known as "suppealume," or glass blowers, and "margareteri," or bead makers. Domenico Miotti and Chrystoforo Briani, of Murano, are credited with making the first blown beads of glass in the XIII Century. These blown beads are said to have been taken by Marco Polo on his voyages, but perhaps the beads used by this famous Venetian traveller were only the paternostri.

The beginning of the present Venetian bead industry seems to have been in the early part of the XV Century, when German traders ordered the glassmakers of Murano to make pipes, or canne, which were sent to Germany to be cut and afterwards retransported to Venice for shipment to the Levant. As the cutting of the canne into sections is the simplest of all operations connected with bead making, I am inclined to the opinion that all the work was done at Murano, except for a brief period when a law prohibited the making of paternostri out of glass on the ground that it was wrong to imitate the natural crystal. This law was substituted by another in 1510 permitting the cutting of paternostri, short and long, out of the canne.

Faceted Beads—Some Famous Combinations

It is not known just when beads began to be rounded, but the first were probably rounded one by one by being placed on a spit and exposed to the flame, just as we know that the early crucibles were very small and were gradually enlarged until they reached present-day dimensions.

A new variety of beads was made in 1860 by Lorenzo Graziati and afterwards by Giuseppe Zecchin and others. This type is called "Macca" and is made by subjecting the tubes to enough pressure to give them facets so that they become quadrated or take a pentagonal, hexagonal or octagonal form. This process is mostly used for jet beads. A slight variation rules lines in the facets, and this type is called "Chanell." Beads with superimposed stripes of different colored fondants are often called "Rosetta" beads, especially when the stripe is a fine one, but the true Rosetta work in beads is shown in the Kongo money bead.

There are many beautiful effects produced by clever compositions or superimposing of fondants, each of which is a special process that cannot be entered into in detail in the limits of this report. Some of the famous combinations thus obtained are the "Chiaro di Luna" (moonlight), "Iride" (iris or opalescent), "Ceraspagna trasparente" (transparent Spanish wax, an amber effect), and "Cristallo Argento" (crystal silver). Tiffany in America is famous for producing these effects in glass. The handmade beads, which are nearly all made from the canne, produce remarkable imitations of amber, yellow and red, lapis lazuli, coral in all shades, verd antique, agate, onyx and most of the semiprecious stones.

Derivation of Italian Word for "Beads"

The generic word for beads in Italian is "conterie," said by Bussolin to be derived from the use of beads by savage tribes as counting money, "moneta contante." Others hold the word to be derived from the expression "contigie mulie-

bri," or women's adornments. The writer ventures the opinion that the word had its origin in the fact that the paternostri, the first beads, were made to be counted in numbering prayers. "Counting one's beads" is a religious act and phrase that still persists and has doubtless given to beads the Italian generic name "conterie"; i.e., things to be counted, from the verb "contare," to count.

Perle, or "perle Veneziane," also covers most varieties of beads. An ancient name is "margarete," and there are many other varieties and classifications with distinct names.

The Laboratory

By J. B. KRAK

Technical Analysis of Producer Gas

The chemical analysis of producer gas consists in the determination of the proportions by volume of carbon dioxide, ethylene, oxygen, carbon monoxide, hydrogen and methane. The difference required to make up 100 per cent is assumed to be nitrogen.

The analysis is effected by exposing the constituents to various absorbing agents, one at a time, to remove the given constituent, and by observing the diminution in volume. In case the gas be insoluble, as for example, methane, it is burned and the carbon dioxide formed is determined by absorption.

In technical work one of the modifications of the Orsat apparatus is frequently used. For accurate work, however, no apparatus has yet displaced that of Hempel.

THE ORSAT APPARATUS. The apparatus is enclosed in a case to permit of transportation from place to place. The measuring tube is jacketed with water to prevent changes of temperature affecting the gas volume. The apparatus consists essentially of a leveling bottle, the burette and the pipettes, which are connected by a glass tube.

PIPETTE NO. 1. For carbon dioxide. Absorbent caustic potash solution (one part caustic potash, purified sticks, not "by alcohol," dissolved in two parts of water).

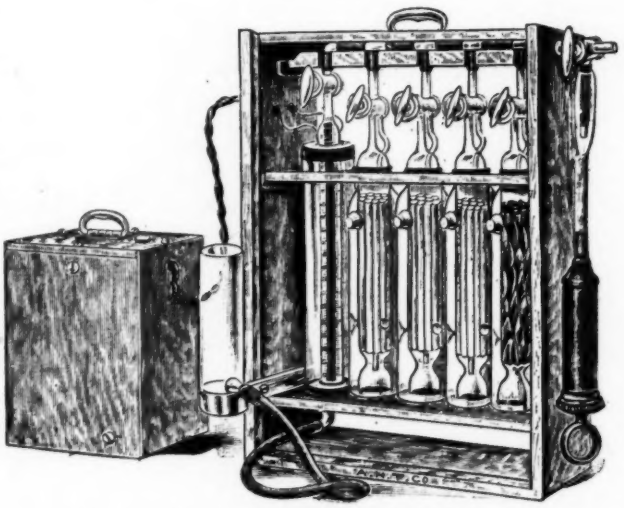
PIPETTE NO. 2. For ethylene. Absorbent, fuming sulphuric acid, or a saturated solution of bromine in water.

PIPETTE NO. 3. For oxygen. Absorbent alkaline pyrogallate. Dissolve 20 grams of pyrogallic acid in 45 c.c. of water and make up to 250 c.c. with caustic potash solution, the same as in No. 1.

Phosphorus may be used for oxygen absorption if desired by substituting phosphorus sticks for glass tubes. To make sticks melt carefully under water and by means of a rubber bulb suck up into a glass tube. Cool by plunging into cold water and force out into the pipette. The pipette should be covered with black paper to prevent the action of light on the phosphorus.

PIPETTE NO. 4. For carbon monoxide. Absorbent cuprous chloride. Dissolve 50 grams of cuprous chloride in 250 c.c. concentrated hydrochloric acid, boiling gently in a loosely covered flask to remove the color. The flask should contain coils of sheet copper. The solution should be set away in a dark place until the brown color clears up and it is clear white or straw color. The pipette in which this solution is used should have a number of copper coils, which can be made by winding copper wire around a stirring rod.

Rubber bags are usually attached to the capillary opening at the rear of the pipettes to prevent free access of air and to allow the escape of the confined air when the solution is permitted to flow back again in the pipette after having been used.



GAS ANALYSIS APPARATUS AND EXPLOSION COIL

MANIPULATION. By lowering the water-level bottle after closing the three-way stopcock, draw the solutions in the pipette up to a definite reference mark on the capillary tubes, about midway between the stopcock and the body of the pipette. Open the three-way stopcock and by raising the water level bottle fill the burette completely with water. The apparatus is now ready for the sample. Connect with the gas supply directly or with the sample collection bottle. Draw into the burette a little more than 100 c.c. of the sample. Allow to stand until the gas has come to the temperature of the apparatus and make final adjustment to 100 c.c. When readings are taken, hold the bottle so that the water-level is the same as that in the burette.

ANALYSIS. Absorb carbon dioxide, ethylene, oxygen and carbon monoxide in the order given in pipettes Nos. 1, 2, 3 and 4 respectively. In passing the gas into the pipettes it is well to first pass a small portion into the top through the non-bubbling capillary, as this forces the liquid out of this tube and prevents drawing over when the solution is after-

wards brought up to the reference mark. Repeat all absorptions till a constant reading is obtained in the burette.

After the fuming sulphuric acid and cuprous chloride absorptions pass the gas through the first pipette, containing caustic potash, to remove acid fumes before reading.

Methane, hydrogen and nitrogen now remain in the burette. Methane and hydrogen are estimated by explosion as follows:

Discard all but about 15 c.c. of the residue, or reserve in the third pipette for check. Add air to the 15 c.c. till the reading is about 50 c.c. on the burette or 50 c.c. of mixture taken for explosion. To facilitate the explosion a few c.c. of pure hydrogen, or some gas formed by electrolysis of water may be added, allowance being made for the volume of the added hydrogen. Mix the gases thoroughly, which may be hastened by passing through pipette No. 1, in which case a new reading should be taken before explosion. Close the stopcock at the top of the burette, also the check on the water-level tube and explode. Allow to cool and read the total contraction.

By the explosion one volume of methane burns to one volume of carbon dioxide, which is measured by passing through the caustic potash pipette and subtracting from the volume before explosion. This gives the methane in the residue taken. The contraction due to the combustion of methane is twice the volume of the methane. The remainder of the contraction is due to the combustion of hydrogen and the total volume of hydrogen in the mixture is two-thirds of this contraction. The volume of hydrogen which was added is deducted, and the remainder of the hydrogen is that which was present in the gas used for the test. Carbon dioxide, ethylene, oxygen and carbon monoxide are read directly as per cent after the successive absorptions which when added together and subtracted from 100 leaves a residue containing methane, hydrogen and nitrogen.

The following example will make clear the method of calculation:

Sample of gas taken for analysis	100. c.c.
Volume after absorption of carbon dioxide	95.4 c.c.
Volume after absorption of ethylene	95.2 c.c.
Volume after absorption of oxygen	94.7 c.c.
Volume after absorption of carbon monoxide	70.1 c.c.
Volume of residual gas taken for determination of hydrogen and methane	15.05 c.c.
Volume after adding hydrogen	20.0 c.c.
Volume after adding air	48.55 c.c.
Volume after explosion	35.7 c.c.
Volume after absorption of carbon dioxide	35.5 c.c.

We then have:

Carbon dioxide	100 — 95.4 =	4.6 per cent.
Ethylene	95.4 — 95.2 =	0.2 per cent.
Oxygen	95.2 — 94.7 =	0.5 per cent.
Carbon monoxide	94.7 — 70.1 =	24.6 per cent.

METHANE. 15.05 c.c. of the residual gas contained 35.7 — 35.5 = 0.2 c.c. of methane. But 15.05 c.c. of the residual gas correspond to $15.05 \times \frac{100}{70.1}$ c.c. of the original sample and the percentage of methane is $\frac{0.2 \times 70.1}{15.05} = 0.9$ per cent.

HYDROGEN. The contraction due to explosion was 48.55 — 35.7 = 12.85 c.c. Contraction due to combustion of methane = 2 × 0.2 = 0.4 c.c.

Therefore, contraction due to combustion of hydrogen = 12.45 c.c.

Total volume of hydrogen present = ⅔ × 12.45 = 8.3 c.c.

Volume of hydrogen added was 20 — 15.05 = 4.95 c.c.

Therefore, volume of hydrogen in 15.05 c.c. of residual gas was 8.3 — 4.95 or 3.35 c.c. and percentage of hydrogen in the original sample $= 3.35 \times \frac{70.1}{15.05} = 15.6$.

The composition of the gas by volume is therefore:

Carbon dioxide	4.6 per cent.
Ethylene	0.2 per cent.
Oxygen	0.5 per cent.
Carbon monoxide	24.6 per cent.
Methane	0.9 per cent.
Hydrogen	15.6 per cent.
Nitrogen (by difference)	53.6 per cent.

No correction for temperature and pressure is needed because all volumes were measured at the same temperature and pressure and the proportion of the different constituents is the same at 0 deg. C. and 760 mm. as at any other temperature and pressure.

CALCULATION OF THE HEATING VALUE FROM THE ANALYSIS

In stating the calorific power of gas a distinction is often made between "gross" and "net" heating values. The gross calorific power represents the heat obtained by burning a unit volume of gas and cooling the products to the same temperature as that of the gas before combustion. The products of combustion are carbon dioxide and steam mixed with the nitrogen present in the gas and that present in air used in combustion. In cooling the mixture of gases to atmospheric temperature the steam is condensed and its latent heat given up. In glass making this amount of heat is not available because the products of combustion are led away from the furnace at a high temperature. The latent heat of steam is therefore deducted from the gross calorific power and the value thus obtained is called the net calorific power of the gas.

CALORIFIC POWER OF GASES. (Burned at constant pressure).

	Calories per cu. meter		B. t. u. per cu. ft.	
Gas	Gross	Net	Gross	Net
Carbon monoxide	3.046	.....	342.4	.....
Ethylene	15.239	14.266	1713.0	1603.0
Hydrogen	3.088	2.601	347.1	292.3
Methane	9.541	8.567	1072.0	963.0

The calculation of the calorific power from the illustrative analysis is as follows:

		B.t.u. per cu. ft.
Due to carbon monoxide	0.246 × 342.4 =	84.23
Due to hydrogen	0.156 × 292.3 =	45.60
Due to methane	0.009 × 963.0 =	8.67
Due to ethylene	0.002 × 1603.0 =	3.21
Total B. t. u. per cu. ft.		141.71

The value in calories per cubic meter can be calculated in a similar way.

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CLASSIFIED BUYERS' GUIDE, PAGE 14

"We fear that which we don't know; what we do know, we control."

An American Glass Research Association

Within the past decade leading men of a number of industries have begun to realize that more can be gained by intelligent co-operation than by a policy of cut-throat competition. In some of the most progressive industries mutual mistrust has made place for a policy of give and take, especially where it meant the attacking of problems with which all members of the industry are equally concerned. The result has been the formation of associations, organized with the object to promote the interests of industry in various ways. Some of these associations have decided to take up research work, the results to be available to all contributing members. Others have started campaigns of advertising and education of the consumer. The Glass Container Association and the recently organized Institute of American Meat Packers are examples of the spirit of community of interests which is manifesting itself throughout the industrial world.

The problems of glass making are of a nature different in every branch of the industry; in fact, each factory has its own difficulties to be solved. However, there are certain groups of fundamental problems which are of importance to all manufacturers alike. Their solution would raise the whole industry to a higher plane of development, and would mean a saving of money and materials difficult to overestimate.

One of the most vital questions of the glass industry is that of heat economy, which is becoming more and more acute due to the exhaustion of the sources of natural gas, and the consequent increase in price of the remaining supply. While fuel oil has been used as an emergency substitute, it is not likely that it will become a factor of importance in the glass industry. Experiments are in progress on the use of electrical energy for melting glass. The results thus far obtained are promising, but give no reason to believe that electricity will be used on a manufacturing scale in the near future. Coal, therefore, is the only available source of fuel at the present time and since the use of powdered coal appears to be unsuitable, it is evident that the transformation of coal into gas is the only efficient manner of its use in glass manufacture.

Improvement in the design and operation of gas producers, and utilization of low grade coals for gas making are some of the possibilities for betterment which would be of great benefit to the glass industry.

It is a well known fact that there is room for improvement in the design and operation of glass furnaces. Present practice is to a large extent the outgrowth of empirical methods which, in many instances, are open to criticism. When confronted with the enormous heat losses of even the best equipped furnaces, designers frequently express the opinion that no better utilization of heat can be expected until more resistant refractories are available. They point to the fact that saving of heat through insulation cannot be practiced because refractory materials cannot withstand the high temperatures which would result if furnaces were protected from excessive radiation. From these statements it appears that fuel utilization is a matter of refractories as much as of furnace design. Closely related to these problems are those

of regulation and measurement of furnace temperatures.

These basic problems of the industry: fuel utilization, furnace design and operation, refractories and pyrometry would require for their solution an amount of study and an outlay of money which few, if any members of the industry would be willing to undertake. An American glass research association supported by the whole industry could undoubtedly solve some of these problems and could plan improvements which would more than compensate the members for the expense of the enterprise. The possibilities for service of such an association are great. The splendid results obtained in other industries and the ever increasing sphere of their usefulness are indications that the formation of an American glass research association would mean an important step in advance to the American glass industry.

Help Your Industry and You Help Yourself

It is very desirable that all glass manufacturers give hearty encouragement to, and earnestly co-operate with the movement initiated, as explained on another page, by the Refractories Manufacturers Association, for the collection of authentic data relating to actual furnace conditions from users of refractories in the thirteen industries which consume the bulk of this material. In the glass industry, as in others, rapidly changing conditions brought about by new methods and the necessity of obtaining greater production from each unit has created an unsatisfied demand for refractories of quite different characteristics from those heretofore employed, and the object of the survey about to be made is the obtaining of facts regarding actual working conditions, so that the changes in glass furnace requirements can be properly co-ordinated with changes in refractory material.

The success of the survey depends upon the individual users of refractory brick and since every manufacturer who employs high heat must use refractory brick, a remarkable opportunity exists for effective co-operative work. It may be difficult at first for some users of refractories to see the benefit they will derive through co-operation, but open-minded consideration of the plan should remove all doubts.

Technical Consultation Service

THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility THE GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions are invited to submit them.

Questions should be submitted in writing and will be answered by mail as promptly as possible. The sources of all inquiries will be held in strict confidence.

Question 37.—Books on Glass.—We expect in the near future to be called upon to do chemical work for a glass industry which may be located here, and would be glad to have you advise us as to what books of a practical nature are published on this subject. The company expects to make bottle glass and window glass.

Answer.—We are sending you herewith a list of books on glass making.

We consider the German book by Dralle the most practical and the most complete. However, all of the books mentioned are more or less of a general nature and do not give the information needed by consulting chemists.

We desire to call your attention to the fact that in THE GLASS INDUSTRY a number of articles have been published which deal with every-day problems in glass factories. With the object of facilitating the work of the glass chemist we have published a number of articles on the analysis of the raw materials and of the finished products of the glass industry, and we feel that the information supplied in these articles will be interesting to you.

We would further bring to your attention that through the Technical Consultation Service of our publication we are glad to answer to the best of our ability any questions which you may wish to submit.

BOOKS ON GLASS

In English—"Glass Manufacture," by Walter Rosenhain, published by D. Van Nostrand Company, N. Y. "American Glass Practice," by Bastow, published by D. Van Nostrand Company, New York. "Glass Manufacture and the Glass Sand Industry of Pennsylvania," by C. R. Fettke, published by Topographic and Geologic Survey of Pennsylvania, Harrisburg, Pa. "The Manufacture of Optical Glass and of Optical Systems," published as Ordnance Department Document No. 2037, Government Printing Office, Washington, D. C. "Silica and the Silicates" (Chapter on Glass), by Audley, published by D. Van Nostrand Company, New York.

In French—"Guide due Verrier," by G. Bontemps, published by Librairie due Dictionnaire des Arts et des Manufactures, Paris, France. "Ver et Verrerie," by L. Appert and J. Henrivaux, published by Gauthiers, Villars & Fils, Paris, France.

In German—"Die Glasfabrikation" (two volumes), by Robert Dralle, published by R. Oldenbourg, Munchen, Germany. "Handbuch der Glasfabrikation," by E. Tscheuschner, published by Bernard Friedrick Voight, Weimar, Germany. "Die Glasfabrikation," by Raimond Gerner, published by A. Hartlebens Verlog, Vienna, Austria.

Journals—*Journal of the Americal Ceramic Society*, published monthly, at Easton, Pa. *Journal of the Society of Glass Technology*, published quarterly, at Sheffield, England. Membership in either of these societies includes subscription to the journal. For further information regarding the British publication address Wm. M. Clark, American secretary, Nela Park, Cleveland, Ohio.

New Books

THE STRUCTURE OF ABRADED GLASS SURFACES. By F. W. Preston. Advance proof. *Trans. Opt. Soc.* Vol. XXIII. (1921-1922) No. 3.

SUMMARY. The physical nature of the processes involved in the workshop operations of cutting and grinding are but little understood, such attention as these operations have received being mainly of an empirical nature. In this paper some preliminary observations are recorded on the tooling of hard brittle substances where the phenomena may be expected to be simplest. Even here they are sufficiently complex. The primary object is to substitute the conception of a flaw- or fissure-complex for the current view of a hill-and-hollow structure, as characterizing a ground surface in brittle materials.

PART I. *Section I* describes observations on the flaws produced in glass by stationary, rolling and sliding spheres, and by glazier's diamonds and wheels. *Section II* deals with the structure of ground glass surfaces, applying the results of the previous paper, and showing the surface to be a fissure-complex. *Section III* explains the double refraction observed by Twyman near the surface of these pieces of ground glass. PART II. *Section I* shows the enhanced solubility of ground surfaces in hydrofluoric acid, and suggests a value for the upper limit of the thickness of the flowed, or surface-tension, layer on polished glass. *Section II* describes the structure of polished surfaces of glass and similar materials as developed by etching, showing that mechanical abrasion is still active during polishing, and also confirming a low value for the thickness of the surface tension film.

Correction

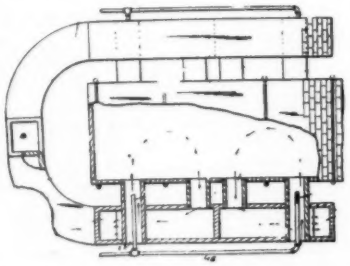
A typographical error appeared in the selenium batch formula given in Irving E. Adams' article on page 220, November issue. The sixth item should read "Cullet equals 350 pounds to 500 pounds of sand," instead of "350 pounds to 100 pounds of sand."

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

Copies of the Patent Specifications mentioned below may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c. each.

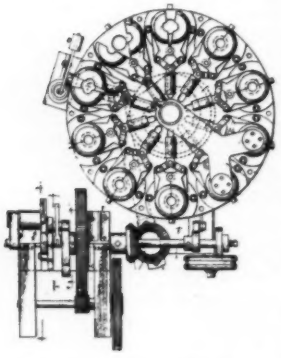
Recuperator for Glass Furnaces and the Like. U. S. 1,432,706. October 17, 1922. William McLaughlin, Los Angeles, Cal., assignor of one-half to Charles E. Norton, Glendale, Cal.



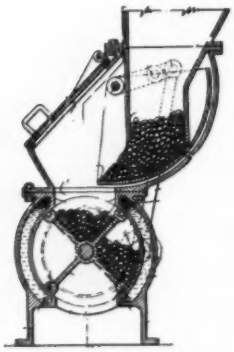
This invention relates to a glass furnace, comprising a melting tank having gas outlet flues along its walls and terminating in a horizontal flue, a chimney into which the ends of the horizontal flue converge, air inlet passages extending through the horizontal flue and spaced from the walls of the flue and placed at the remote ends thereof, the inlet passages and outlet flues being in the same horizontal plane, and burners adjacent the inner ends of the air passages.

Glass-Manufacturing Machinery. U. S. 1,431,436. October 10, 1922. Samuel E. Winder, of Chicago, Ill.

The machine in general is divided into what may be called two distinct machines, the molding machine and the blowing machine. Each of these machines has for its central feature a rotating table which supports a plurality of molds, one set for preparing the blank for blowing and the other set for supporting the blank when the blowing is taking place. These tables are each rotated in any suitable manner step by step so as to carry the molds from one position to another, in order to operate properly upon the molten glass; and a sufficient number of molds are provided to allow the molten glass to settle or harden sufficiently for suitable operation.



Gas-Producer Feed. U. S. 1,433,109. Oct. 24, 1922. Oakley T. Brown, of Aubudon, N. J., assignor, by mesne assignments, to United States Cast Iron Pipe and Foundry Company, of Burlington, N. J.



This invention relates to feeding mechanisms for supplying fuel, etc., to gas producers, furnaces, kilns and the like at intervals and at the same time sealing against gas discharge therefrom.

The purpose of this invention is to provide a small and effective automatic control for the fuel, etc., located back of (generally above) the sealing mechanism.

A further purpose is to supply the fuel, etc., through a rotary sealing spider or drum to which the fuel is fed from above by means of an oscillatory scoop upon which the coal is initially received and rests.

Glass. U. S. 1,431,166. October 10, 1922. Fred M. Locke, of Victor, N. Y.

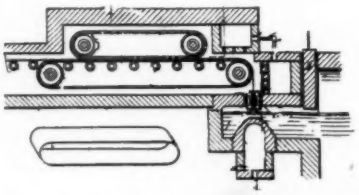
The object of the invention is to produce a glass of low coefficient of expansion and high stability, and as a specific instance of this invention, the inventor discloses and claims a glass of approximately the following analysis:

SiO_2 78%—B_2O_3 15%—Na_2O 4%—CaO 1%—K_2O 1%—Al_2O_3 1%

A glass of the above analysis is highly efficient for numerous purposes, particularly where a low coefficient of expansion is desired, the specific composition disclosed producing a glass having a coefficient of expansion of approximately .0000035.

A batch for making the foregoing glass will consist approximately of 69.50% silica, 20% boric acid, 6% cryolite, 4% sodium nitrate and .5% calcium oxide.

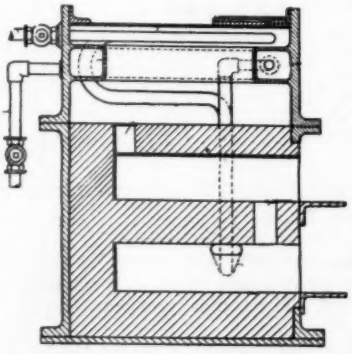
Process and Apparatus for Making Sheet Glass. Reissue U. S. 15,452. September 12, 1922. John C. Crowley, of Cleveland, O., assignor to the Libbey-Owens Sheet Glass Company, of Toledo, O.



This invention relates to the art of drawing glass in sheet form from a mass of molten glass, and more particularly, it relates to the usage of an endless metal belt upon which the sheet is drawn and bent, to side holding devices as a mechanical means of sheet control and to the fire boxes that govern the plasticity of the sheet as it is being drawn.

The inventor claims in an apparatus for drawing sheet glass, a receptacle for containing a prepared mass of molten glass, means, including an endless metal belt carrier for drawing a continuous sheet of glass from the mass of glass in said receptacle, said metal belt carrier being the means for bending the sheet, the means for supporting and carrying the sheet and the means for flattening the sheet, said metal belt carrier continuously contacting the sheet of glass from the moment that the sheet starts to bend until it is sufficiently flattened and set for the lehr, and means for holding under tension a desired vertical length of the sheet's edge, for maintaining a predetermined width of the sheet drawn.

Furnace for Hardening or Tempering Steel Tools or for Heating or Annealing Metals, Glass, Pottery, or the Like. U. S. 1,432,946. Oct. 24, 1922. Johannes Robert Carl August, of Halifax, England.

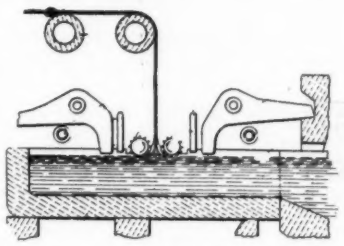


This invention has reference to furnaces for hardening or tempering steel tools, or for heating or annealing metals, glass, pottery and the like, such furnaces being of the type wherein the temperature is produced by the burning of gas in combination with air, and wherein the gas and air supply nozzles shall enter the combustion chamber of the burner at right angles in such manner that the issuing air shall be brought into intimate contact with the heated gas to effect an efficient mixing of the same.

Prior to this invention, it has been proposed to form the combustion chamber of the burner of approximately L shape, but according to the present invention, the combustion chamber of the burner is made with inclined sides, and a

floor which gradually slopes upward from the end where the pipes deliver the heated air and gas to the end which communicates with the furnace.

Method and Apparatus for Drawing Sheet Glass. U. S. 1,435,956. Nov. 21, 1922. Joseph P. Crowley, of Toledo, O., assignor to the Libbey-Owens Sheet Glass Company, of Toledo, O.

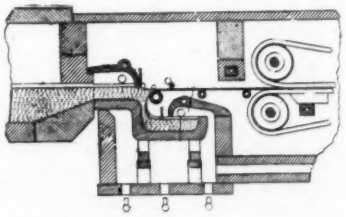


When sheet glass is drawn upwardly from a pot or receptacle, containing molten glass, the glass at the sides, from which the edges of the sheet are formed, is cooler and less plastic than the glass at the center from which the main body of the sheet is formed.

It is an object of this invention to force this cooler glass at the sides to flow toward and into the forming sheet, so as to provide a constant supply of cool glass at the sheet edge sources, and in practicing the invention a plurality of teeth or pickers, moving in closed paths or orbits above the surface of the molten mass, dig into the cooled surface of the glass mass and tend to carry it toward, and upwardly into, the sheet. These teeth or pickers are cooled, to prevent the hot glass from adhering thereto, and the contact with, and proximity of, these cooled members to the molten glass at the sides of the receptacle tends to further cool and stiffen the glass, thus forming the desired stiff edge portions on the drawn sheet.

Molten glass, if allowed to cool slowly, without being kept in motion, tends to devitrify or form so-called "dog metal," and this trouble has often been experiencd at the sides of the receptacle from which the edge portions of the sheet are drawn. A further object of this invention is to prevent this devitrification by keeping the glass in motion at the sides of the receptacle. By stirring up and preventing the premature setting of the surface portion of the molten glass, this invention also tends to eliminate the formation of waves or undulations which often injure the quality of drawn sheet glass.

Apparatus for and Method of Drawing Sheet Glass. U. S. 1,435,958. Nov. 21, 1922. Arthur E. Fowle and Joseph P. Crowley, of Toledo, O., assignors to the Libbey-Owens Sheet Glass Co., Toledo, O.

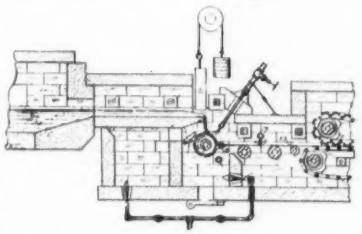


The invention relates to a method and apparatus for drawing sheet glass of that type, in which the sheet is initially drawn from a plastic mass, its opposite surfaces being cooled by the proximity of suitable cooling devices, and the width being maintained by the engagement of edge rollers with the marginal portions of the sheet. Two more specific types of method have thus far been devised, both belonging to the general type. In the one the glass is first drawn vertically from the mass and is then passed over a bending roll into engagement with the drawing table. In the other the glass is drawn horizontally from a mass upon a slab continuing in the same direction onto the drawing table.

The present invention, while relating generally to the horizontal type, involves features of both types, as well as other features which are distinctly novel.

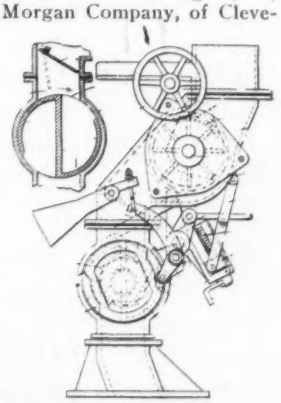
In the horizontal type of drawing, the glass is drawn off from the slab and after traveling over one or more idler rollers and past the point of engagement with the edge rollers, passes onto the drawing table. Some difficulty has been experienced by the tendency of the glass to chill on its under side at the point of leaving the slab and in fact, in the difference in conditions affecting the formation of the upper and lower surfaces of the sheet. With our improvement instead of drawing the glass directly off from the slab, only the portion which forms the top surface of the sheet is drawn from the mass on the slab, while the portion forming the lower surface of the sheet is drawn from an auxiliary mass. This establishes substantially uniform conditions in the forming of both surfaces of the sheet.

Method and Apparatus for Making Continuous Sheet Glass. U. S. 1,436,421. Nov. 21, 1922. James Whitemore, of Detroit, Mich., assignor to the Libbey-Owens Sheet Glass Company, of Toledo, O.



This invention relates to a new and improved method and apparatus for producing a continuous sheet of glass. In methods heretofore used, considerable difficulty has been encountered in transferring the glass from the molten bath into the sheet without marring and streaking the same through contact with foreign objects, particularly when the sheet is drawn off horizontally. If the sheet is drawn off directly from a lip or slot, it is necessary to cool the glass fed into the sheet to such an extent that devitrification occurs on the surface from which the sheet is drawn, causing lines and striations in the sheet. On the other hand, if the glass is maintained in a sufficiently molten condition to flow freely from the source of supply, it is difficult to control the flowing glass and carry it off in sheet form. In practicing the present invention the glass is maintained in a sufficiently hot and molten condition to flow freely from the source of supply without danger of devitrification at the flowing point, and this flow of molten glass is then caught and suspended on a constantly rotating cylinder of refractory material, the glass sheet being then drawn from the mass of cooler glass carried on the surface of the cylinder without being marred by contact with any forming surfaces.

Fuel-Feed Mechanism for Gas Producers. U. S. 1,435,942. Nov. 21, 1922. John F. Rogers, of Cleveland Heights, O., assignor to the Wellman-Seaver-Morgan Company, of Cleveland, O.



This invention relates to fuel feed mechanism of gas producers and has for its chief objects the provision of means for preventing the clogging of the feed mechanism when so-called lumpy coal is being fed to the producer.

More specifically considered, the invention aims to provide an automatically operated device in the form of a gate which permits the feeding of fuel to a movable valve member when the valve is in position to receive the fuel, and stops the feed when the valve opening is being closed so as to prevent lumps of fuel being jammed between the valve and the chamber receiving it, thereby minimizing the danger of breakage of the feed mechanism or of a part utilized in transmitting power from the valve actuating mechanism to the valve proper.

Molds for Glass Manufacture. British Patent No. 12,020/21. R. L. Frink, 50 Bedford Square W., London, England. Metal molds for glass working are made with a porous or finely pitted surface. Such molds may be made from an alloy of aluminum or copper with calcium, barium, or magnesium, the surface being rendered porous by treating it with an alkaline solution. A suitable alloy contains about 2 per cent of calcium or barium. In making such an alloy it is recommended that an alloy containing 75 per cent of aluminum and 25 per cent of calcium, &c., be first prepared at a temperature of 500° C. to 1,100° C., and that this be added in the required proportion to pure molten aluminum. For use the molds may be dipped in water, paraffin oil, &c.—*Pottery Gazette and Glass Trade Review.*

The Glass World and What It Is Doing

News of the Industry Briefly Told

Important Merger of Automatic Machinery Interests

Much interest was created throughout the trade by the announcement, early in November, that an amalgamation of the Hartford-Fairmont Company interests with those of the Empire Machine Company had been accomplished. Details of the merger were given in the announcement issued under date of November 6, by F. Goodwin Smith, vice-president of the Hartford-Fairmont Company, the text of which follows:

"A combination of great importance for the present, and especially for the future, of the glass industry, has just been announced in the formation of the Hartford-Empire Company of Hartford, Conn., a five-million dollar corporation.

"The Hartford-Empire Company has taken over the business of the Hartford-Fairmont Company of Hartford, Conn., and the Empire Machine Company of Corning, N. Y.

"The Hartford-Fairmont Company is well known as the chief representative in the development of automatic glass feeding machines employing the new gob process. This company was organized in 1912, for the special purpose of developing automatic machinery employing this process. As soon as the gob feeding process became thoroughly established, the business of the company widened out in the development of high speed universal forming machines and various other important accessory types of machines.

"The company is substantially a developing and licensing concern, and furnishes and licenses glass-making machines throughout the world.

"This company has been the pioneer in revolutionizing the automatic machinery end of the glass industry, and the development work has always been in the hands of a corps of very able engineers and practical glass experts, with Karl E. Peiler as chief engineer. The financial strength of the company has always been well recognized.

"Among the larger manufacturers using the Hartford-Fairmont Company's automatic machines are the Illinois Glass Company of Alton, Ill.; the Monongah Glass Company of Fairmont, W. V.; the Thatcher Manufacturing Company of Elmira, N. Y., and the Salem Glass Works of Salem, N. J.

"The other factor in the merger, the Empire Machine Company, was formerly located at Corning, N. Y., and was controlled by the same interests which control the well-known Corning Glass Works.

"The Empire Machine Company has likewise been for a long time a leading representative in developing machinery for blowing and forming paste mold ware in general, and more especially electric bulbs,—and the same machinery is now being applied successfully in the production of high-grade tumblers and chimneys. A large portion of the electric light bulbs made in the United States is produced on Empire machines, and the company also has very important foreign connections.

"Another important fact is that the Hartford-Empire Company will be connected by close contract relations with the Corning Glass Works, everywhere recognized as the leader in special glasses, such as pyrex ware, optical ware, railroad signal lenses and railroad lantern globes, electric bulbs, and various forms of low-expansion and chemical-resisting wares, as well as high quality art glasses.

"The Hartford-Empire Company is organized under the laws of Delaware, with very broad powers. The capitalization is divided into 100,000 shares of common stock no-par value and $1,500,000 of preferred stock. Its principal place of business is at Hartford, Connecticut. Its officers are as follows: President, Bartlett Arkell; first vice-president, F. Goodwin Smith; second vice-president, Alexander D. Falck; secretary and treasurer, Herbert Knox Smith; assistant treasurer, F. Goodwin Smith; assistant secretary, Harry L. Heintzelman.

"The directors are as follows: Bartlett Arkell, president of the Beech-Nut Packing Company; Alanson B. Houghton, American Ambassador to Germany; Alexander D. Falck, president of the Corning Glass Works, and Empire Machine Company; Harry L. Heintzelman, president of the Monongah Glass Company, Fairmont, W. Va.; William H. Honiss, patent solicitor, Hartford-Fairmont Company, Hartford, Conn.; Arthur A. Houghton, New York City; F. Goodwin Smith, vice-president Hartford-Fairmont Company; Vernon M. Dorsey, of Dorsey & Cole, patent attorneys, Washington, D. C.; Herbert Knox Smith, former United States Commissioner of Corporations.

"This combination will be of special interest to manufacturers of glass containers, considering the present growth of the industry and the great and significant changes that are now taking place in the methods of producing glassware by means of full-automatic machinery.

"The formation of this company will result in:

(a) Much greater financial resources for the development work hitherto controlled by the two subsidiary companies, thereby allowing much more thorough and extensive development of glass machinery in general.

(b) It will associate together a large number of patents, also certain groups of highly skilled and inventive ability heretofore working without co-operation along similar lines.

(c) It will bring existing and future developments of glasses themselves into co-operation with the development of automatic machinery, thus combining the two chief essentials for the further growth of the industry.

"The new company has already laid definite plans for undertaking the development of new tank construction, lehring and conveying systems.

"This company will control a very large number of issued patents and allowed claims, as well as pending applications, broadly covering the field of glass-feeding and forming machines and accessory devices. The feeding of glass in gobs is a distinct departure from the first automatic processes which employed the suction principle and the flow feed principle.

"The new company, like the old companies, takes the long-distance view that the success of the company must ultimately rest upon its ability to furnish to the glass manufacturer the most modern machines and devices for producing his articles, at a reduced cost, and also to furnish to him a continuous service of advice and mechanical assistance in the use of its new developments.

"It is quite likely that the new company, with its large engineering force, will act as consulting engineers for several prominent glass manufacturers.

"Pending final adjustment of the new company's affairs, the existing relations between the Hartford-Fairmont Company and its licensees will remain as at present."

Hartford-Empire Acquires Howard Patents

Kay, Totten and Brown, of Pittsburgh, Pa., attorneys for the Howard Automatic Glass Feeder Company, Butler, Pa., have announced that the Hartford-Empire Company of Hartford, Conn., (which now controls the Hartford-Fairmont Company), has contracted for the control of the business and patents of the Howard Automatic Glass Feeder Company. George E. Howard, consulting engineer of the Howard Automatic Glass Feeder Company, has accepted an important position on the engineering staff of the Hartford-Empire Company.

The Glass Industry of Chile*

It is now almost ten years since the manufacture of glass was first ventured upon in Chile. Several business men of Santiago at that time conceived the idea of supplying locally the great demand in the country for such manufactured glass goods as wine bottles, beer bottles, demijohns, flasks, plain table ware, etc., which until then had made of the country an excellent market for foreign merchandise. An idea may be had of the trade previous to that time by a study of the importation of manufactured glass articles as given below for the year 1914.

Country of origin	Wine Bottles, etc.		Bottles for other uses	
	Quantity in gross kilos	Value in gold pesos of 18 English pence	Quantity in gross kilos	Value in gold pesos of 18 English pence
United Kingdom	422,425	50,691	....	....
Germany	12,256,900	1,470,828	13,090	2,491
France	14,925	1,791	4,077	752
Belgium	3,200	384	....	....
Italy	200	24	....	....
United States	4,850	582	....	....
Argentina	5,000	600	....	....
Spain	.....	.....	11	2
Totals	12,707,500	1,524,900	17,178	3,245

Country of origin	Table Glassware, etc., Fine		Table Glassware, etc. Ordinary	
	Quantity in gross kilos	Value in gold pesos of 18 English pence	Quantity in gross kilos	Value in gold pesos of 18 English pence
United Kingdom	173,441	60,667	3,070	4,897
Germany	2,146,183	640,949	14,397	19,023
France	130,520	50,599	3,172	5,593
Belgium	371,962	124,873	9,877	12,318
Italy	5,176	2,332	180	202
Spain	9,256	2,284	....	....
The Netherlands	17	5	....	....
Austria-Hungary	4,141	1,402	....	....
Japan	38	18	....	....
China	10	3	....	....
United States	221,693	64,966	260	872
Argentina	341	171	9	45
Switzerland	.....	.....	47	67
Totals	3,062,778	948,289	31,012	43,017

Country of origin	Demijohns	
	Quantity in gross kilos	Value in gold pesos of 18 English pence
United Kingdom	5,470	1,094
Germany	48,100	9,620
United States	80	16
Totals	53,650	10,730

Several small factories were installed as early as 1913, with semi-automatic machinery, but in the beginning there were many difficulties to overcome; raw materials were obtainable in the country but there were no experienced operators to be had, so that it was found necessary to bring in such persons from abroad to instruct workers and supervise operations. Bottles and demijohns for wines were all that were attempted then, and these were elaborated by the most primitive methods. However, in spite of handicaps the industry grew; the market was good and material and labor cheap. So favorable were the conditions, in fact, that only through gross mismanagement could success have failed to materialize.

La Sociedad Fabrica Nacional de Vidrios, which was the most important of the factories which had started up, soon acquired the ownership of others, and through the investment of more capital and the purchase in Europe of modern machinery, it has now three large, well-equipped factories—two located in the city of Santiago, and the other in Rancagua—turning out bottles at the rate of 18,000,000 per year; demijohns 156,000, and divers manufactured articles, such as tableware, vases, etc., 2,625,964. This company is now organized with a capital of 3,000,000 paper pesos. It has installed in its largest factory (the most important in Chile), located in Santiago, 3 motors of 50 h.p. each, and 10 electric motors with 110 h.p.; 5 compressed-air machines; 3 mills for crushing and preparing raw materials; and 5 large ovens. The production of these latter fluctuates between 38,000 and 40,000 bottles per day, and in articles made of white glass the production is estimated at 18,000 pieces daily. For the carrying on of this work the factory employs 1,200 operators, working in shifts.

Raw materials employed in the glass industry in Chile are: Arsenic, quartz, soda ash, carbonate of lime, Chilean nitrate, sand, oxide of zinc, oxides of tin, lead, cadmium, cobalt, uranium, antimony, bioxide of manganese, refractories, Lota earth, kaolin, and Norman earth. Of these probably 90% are obtained in the country and the balance imported.

In 1920, Government statistics (the latest available) give a total of four factories in operation in the Republic, with a total capital of 10,218,615 paper pesos, and a production of 29,593,859 bottles and 500,000 articles of various description, valued at 7,650,965 paper pesos. The cost of this production was estimated at 6,649,926 pesos, represented by fuel 1,840,010 pesos; raw material, native, 949,076 pesos, and imported, 178,568 pesos; rents, patents, insurance, etc., 568,403 pesos; and salaries and wages, 3,113,869 paper pesos.

The extent which this enterprise has now reached is illustrated by the figures of present importations of bottles, tableware, etc. Compared with the importations of 1914 they will be seen to have enormously diminished. A table giving the statistics for 1921 is given below:

Country of origin	Wine Bottles, etc.		Demijohns	
	Quantity in gross kilos	Value in gold pesos of 18 English pence	Quantity in gross kilos	Value in gold pesos of 18 English pence
Germany	58,306	17,695	....	....
United States	6,159	2,027	....	....
France	448	400	....	....
United Kingdom	1,038	515	64	31
Sweden	95,418	38,250	....	....
Totals	161,369	58,887	64	31

Country of origin	Table Glassware, etc.	
	Quantity in gross kilos	Value in gold pesos of 18 English pence
Germany	172,810	301,922
Argentina	3,366	2,679
Austria	195	336
Belgium	78,286	155,069
China	159	137
Denmark	45	180
United States	109,474	202,545
Spain	1,988	7,140
France	22,895	99,259
United Kingdom	30,723	85,870
The Netherlands	21,022	36,074
Italy	704	6,145
Japan	3,494	3,658
Peru	63	180
Sweden	2,710	6,345
Switzerland	1,278	2,377
Totals	449,212	909,916

Exportations of wine bottles, etc., from Chile in 1921:

Countries to which shipped	Quantity in gross kilos	Value in gold pesos of 18 English pence
Argentina	309	124
Bolivia	1,131,148	328,313
Ecuador	24,200	9,680
Peru	1,173,949	327,202
Totals	2,329,606	665,319

Since the preceding statistics were compiled several new glass factories have been built, or are in process of construction, which intend to purchase up-to-date mechanical machinery and install machines for elaborating cut glass. A difficulty experienced by them in this respect, however, is that of obtaining the latest types of mechanical machines at a reasonable price and of a size and productive capacity compatible with the relatively small population of Chile and its available neighboring markets. There appears to be no aversion to the purchase of American machines; in fact, there is every reason to believe that they would be given the preference because of their superior mechanical characteristics, provided the price and terms were acceptable. Competition from European

*By Rollo S. Smith, Secretary to the American Commercial Attache, Santiago Chile, September 29, 1922.

glass-making machinery is strong in this market and the favorable terms at which they are offered is frequently a determining factor in their acquisition.

A list of the glass factories actually in operation or in process of construction in Chile, is given below, arranged according to their relative importance.

Sociedad Fabrica Nacional de Vidrios, Vicuna Mackenna 1242, Santiago, Chile.

Sociedad Fabrica Nacional de Vidrios, San Diego, 2197, Casilla 187, Santiago, Chile.

Sociedad Fabrica Nacional de Vidrios, Avenida Milah, Rancagua, Chile.

Fabrica de Vidrios "Los Aliadoa," Calle Maria Auxiliadora 580, Santiago, Chile.

Weir, Scott y Cia., Casilla 73-D, Santiago, Chile.

Muzzio i Formas, Calle Nueva Andres Bello 535, Santiago, Chile.

Cabrer i Cabezon, Matias Orvalle 218, Santiago, Chile.

Boher y Jose, Calle Berna 107, Santiago, Chile.

Del Fierro e Hijos, Calle Barros Arana 210, Casilla 706, Santiago, Chile.

Refractories Manufacturers' Industrial Survey

The Refractories Manufacturers Association has appointed a "committee on industrial survey" to obtain complete information regarding the furnaces in which refractory materials are used. It is intended to obtain information through co-operation with consumers, national trade associations, engineering societies, manufacturers of furnace equipment, and the Bureau of Standards. A questionnaire has been prepared which will be used in connection with the survey. This will be submitted to users of refractories with the request that they answer to the best of their ability the twenty-five questions comprising the questionnaire.

The association points out that research in refractories—particularly in connection with the manufacture of refractory brick—has been largely confined to laboratory work. The movement which has been started, however, has for its purpose the uncovering of a mass of information with regard to the furnace conditions which confront this material in actual service. This industrial survey will be conducted in co-operation with committees which have already been appointed in associations of users of refractory brick and with individuals, firms and corporations to whom refractory brick is an industrial necessity.

This survey will consume the better part of two years and it is hoped that preliminary reports will be made at the end of the first three months, the first half year and so on, until the survey is completed. The questionnaire will be distributed to consumers of refractory brick in the thirteen industries to which the bulk of this material goes, including gas plants, glass houses, boilers, and kilns for burning ceramic products.

The questionnaire covers temperature and combustion conditions found in the typical furnace, abrasion, slag action, the presence or absence of uncommon furnace gases, spalling conditions, loads, insulation, character of draft, etc.

When enough information has been received to warrant the issue of a progress report in any single industry, this report will at once be made; it will include a statement of the more general and possibly typical conditions, with data relative to conditions which would properly be considered exceptional in that industry. Meagre as these progress reports may be, they will be an important addition to present knowledge.

Every consumer of refractory brick will derive a certain benefit from the successful prosecution of the work described. Wastes will be eliminated, which cannot help but reduce production costs. Intelligent service will follow authentic knowledge of requirements. The whole movement augurs well for the industry which is launching it and for every industry which finds refractory brick a necessary part of its plant equipment.

Full information and blanks for making the reports may be obtained from F. W. Donahoe, secretary of the Refractories' Manufacturers' Association, Oliver Building, Pittsburgh, Pa., upon request.

Silver Jubilee of American Ceramic Society

The twenty-fifth annual meeting of the American Ceramic Society at Pittsburgh, Pa., February 12 to 16, 1923, will be made a special occasion, celebrating the twenty-fifth anniversary of the founding of the society. Plans are being made for an unusually important program. Each division will hold four sessions for the presentation of papers and discussions. Two of the meetings of the Glass Division, as announced by Secretary Arthur E. Williams, will be held on Tuesday, February 13, and two more on Wednesday, the 14th.

Members of the society are requested to exhibit at the convention examples of the ceramic arts showing developments during the past twenty-five years.

The January number of the *Journal* will be devoted to a review of the history of ceramics and of the society for the past twenty-five years, leaving the annual meeting in February open for the discussion of present and future problems.

The personnel of the executive and other committees in charge of the Silver Jubilee meeting is as follows:

EXECUTIVE COMMITTEE—A. F. Greaves-Walker, chairman; E. W. Tillotson, vice-chairman; R. M. Howe; A. Silverman; J. W. Hepplewhite, secretary.

RAILROAD TRANSPORTATION—C. C. Phillips, chairman; Robert F. Ferguson, J. E. Hansen.

HOTEL ACCOMMODATIONS—A. H. Chandler, chairman; A. E. Blake, J. L. Crawford.

PUBLICITY—Arthur W. Kimes, chairman; John M. Hammer, E. W. Tillotson.

SERVICE—H. G. Schurecht, chairman; H. G. Elledge, Arthur E. Gray, Willard J. Sutton, W. F. Wenning.

SMOKERETTE—Raymond M. Howe, chairman; F. G. Lord, H. S. Robertson, Drew M. Thorpe.

BANQUET—Alexander Silverman, chairman; M. G. Babcock, H. L. Dixon, F. W. Donahoe, C. R. Peregrine, Francis W. Walker, Jr.

RECEPTION—J. Spotts McDowell, chairman; Charles R. Fettke, Francis C. Flint, H. C. Fry, Samuel M. Kier, Charles J. Kirk, Donald W. Ross, H. G. Willets, E. J. Winkleman.

FINANCE—Henry L. Dixon, chairman; Marion G. Bryce, Porter Kier, J. M. Lambie, Kenneth Seaver, Thomas Wilson.

ENTERTAINMENT OF LADIES—Mrs. A. F. Greaves-Walker, chairman; Miss Edna P. Carson, Miss Mabel C. Farren, Mrs. H. L. Dixon, Mrs. R. M. Howe, Mrs. Alexander Silverman, Mrs. E. W. Tillotson.

TRIPS—J. Spotts McDowell, chairman; D. M. Buck, J. W. Cruikshank, L. P. Forman, Marsden H. Hunt, F. K. Pence, Francis W. Walker, Sr.

The Manufacture of Glass in the United States in 1921

Reports made to the Bureau of the Census show a considerable decrease in the activities of the establishments engaged in the manufacture of glass during the year 1921 as compared with 1919. The total value of products reported for 1921 amounted to $212,593,000 compared with $261,884,000, for 1919, a decrease of 18.8 per cent.

The decrease in the number of establishments is accounted for by the fact that 37 plants that reported in 1919 were idle or out of business in 1921; also there were 6 establishments omitted because each reported products valued at less than $5,000 in 1921.

Of the 328 establishments reported for 1921, 89 were located in Pennsylvania; 72 in West Virginia; 37 in Ohio; 30 in Indiana; 19 in New York; 15 in Oklahoma; 14 in New Jersey; 11 in Illinois; 9 in California; 6 in Maryland; 4 each in Arkansas and Kansas; 3 each in Missouri and Virginia; 2 each in Louisiana, Texas and Wisconsin; and 1 each in Massachusetts, Michigan, Rhode Island, South Carolina, Tennessee and Wyoming. Pennsylvania, the leading state in the industry in 1921, produced 30.7 per cent. of the total value of products in that year.

The decrease in the value of products has been accompanied by decreases in the number of persons employed, in the total amount paid for salaries and wages, and in the cost of materials used. In December, the month of maximum employment, 66,643 wage earners were reported, and in July, the

month of minimum employment, 41,850—the minimum representing 62.8 per cent of the month of maximum employment. The average number employed during the year was 54,676 in 1921 as compared with 77,520 in 1919. A classification with reference to the prevailing hours of labor in the establishments in which employed shows that for 7,107, or 13 per cent of the total (average) number of wage earners, the prevailing hours were 44 or less per week; for 6,363, or 11.6 per cent, between 44 and 48; for 23,851, or 43.6 per cent, 48; and for 8,223, or 15 per cent, between 48 and 54.

The statistics for 1921 and 1919 are summarized in the following statement. The figures for 1921 are preliminary and subject to such change and correction as may be found necessary from a further examination of the original reports.

COMPARATIVE SUMMARY OF STATISTICS FOR THE MANUFACTURE OF GLASS, 1921 AND 1919.

	1921[1]	1919[1]	Per Cent of Decrease[2]
Number of establishments...	328	371	11.6
Persons engaged	59,705	83,656	28.6
Proprietors and firm members	50	60	....
Salaried employees.....	4,979	6,076	18.1
Wage earners (average number)	54,676	77,520	29.5
Salaries and wage payments.	$79,852,000	$100,891,000	20.9
Salaries	12,290,000	13,364,000	8.0
Wages	67,562,000	87,527,000	22.8
Contract work	131,000	241,000	45.6
Cost of materials.....	86,883,000	90,780,000	4.3
Value of products.....	212,593,000	261,884,000	18.8
Value added by manufacture[3]	125,710,000	171,104,000	26.5

[1]Figures for 1921 do not include establishments reporting products under $5,000 in value, thus excluding 6 establishments which employed 15 wage earners, and in the aggregate reported products to the value of $16,500. The figures for 1919, however, include 1 establishment of this class which employed 5 wage earners.
[2]Percentages omitted where base is less than 100.
[3]Value of products less cost of materials.

Detailed statistics of glass production for 1921 and 1919 are given in the following table:

Products	1921	1919	Per Cent of Decrease
TOTAL VALUE.....	$212,593,000	$261,884,000	18.8
Building glass	68,468,000	83,713,000	18.2
Window glass—			
Square feet	254,811,130	368,912,209	30.9
Value	$23,543,000	$41,101,000	42.7
Obscured glass, including cathedral and skylight:			
Square feet	20,881,698	33,822,302	38.3
Value	$2,547,000	$4,300,000	40.8
Plate glass, total cost, square feet.....	79,965,703	72,849,340	*9.8
Polished:			
Square feet	56,238,783	56,823,749	1.0
Value	$37,261,000	$33,348,000	*11.7
Rough, made for sale—			
Square feet	711,744	788,742	9.8
Value	$107,000	$171,000	37.4
Wire glass—			
Polished:			
Square feet	4,484,917	1,229,077	*264.9
Value	$1,512,000	$635,000	*137.7
Rough, made for sale as such—			
Square feet	11,674,522	14,462,409	19.3
Value	$1,804,000	$2,271,000	20.6
All other building glass.	1,694,000	1,886,000	10.2
Pressed and blown glass..	57,375,000	70,749,000	18.9
Bottles and jars.....	83,692,000	94,670,000	11.6
All other products.....	3,058,000	12,752,000	76.0

*Denotes increase.

Corning Glass Retires Preferred Stock

A new issue of $2,000,000 fifteen-year, 5½% sinking fund gold debenture bonds dated December 1, 1922, has been made by the Corning Glass Works. The proceeds of this issue, together with the funds of the corporation, will be used to retire $3,000,000 preferred stock now outstanding. The Corning Glass Works manufactures about 40% of the bulbs and tubing for all the incandescent electric lamps made in the United States, about 65% of all signal glass, lantern globes, etc., used by American railroads, Pyrex baking and laboratory ware, thermometer tubing, optical glass and lighting and artistic glassware.

Miscellaneous Items

Members of the **National Association of Window Glass Manufacturers** operating hand plants will meet at Pittsburgh on December 4.

A safety code for conveyors and conveying machinery is being prepared under the sponsorship of the American Society of Mechanical Engineers and the National Bureau of Casualty and Surety Underwriters.

An increase of 10 per cent in wages of window glass workers, to take effect December 1, was agreed upon at Cleveland, O., on October 30, by committees representing the hand window glass plants and the National Window Glass Workers.

The Annual Glass and Pottery Exhibit at the Fort Pitt Hotel, Pittsburgh, Pa., will be held January 8 to 27. Special efforts to make the coming exhibit better than any previous one have been made by the table glassware manufacturers, the Pittsburgh Chamber of Commerce, and the local hotel managers.

The new form of bills of lading, prescribed by the Interstate Commerce Commission must be used on and after January 1, 1923. J. T. Hendricks, director of traffic, Glass Container Association, states that inquiry from railroad officials indicates there will be no further postponement beyond December 31, 1922.

The eighth annual meeting of the National Glass Distributors' Association will be held at the William Penn Hotel, Pittsburgh, Pa., on December 5 and 6. The American Window Glass Company will entertain the members at dinner on Tuesday evening. The general business session will be held on Wednesday morning, December 6, after which a luncheon will be given by the Interstate Window Glass Company to members and friends.

All American claimants against Germany must formally file their war claims with the State Department within six months of October 10, when the first meeting of the international commission will be held in Washington. This was announced at the State Department following a conference between under Secretary of State Phillips and Robert C. Morris, a New York lawyer, who will represent American claimants.

The Federal Grand Jury investigation at Cleveland, O., of an alleged window glass trust, in violation of the Sherman anti-trust law, while a similar grand jury inquiry was going on in New York was held to be unwarranted by Federal Judge D. C. Westenhaven in an opinion handed down on November 11th.

Judge Westenhaven ordered the vacation of subpœnas issued "either until the government has tried the defendants on the New York indictments or has filed a stipulation in this court evidencing its intention to try the defendants here first upon any new indictments that may be obtained."

The National Exposition of Power and Mechanical Engineering will be held at the Grand Central Palace, New York, from Thursday, December 7 to December 13, closing, however, on the intervening Sunday. It has been planned in cooperation with the national societies interested in the economy of fuel and in the production and use of power generated therefrom. Among the subjects to be discussed at the American Society of Mechanical Engineers' meeting, to be held in conjunction with the exhibition are: Development and Use of Stokers, and Ash Removal—a symposium of modern handling methods. The list of exhibitors already assures the greatest exhibition of power plant equipment ever contemplated.

Reduced freight rates into Mexico are announced by J. T. Hendricks, director of traffic, Glass Container Association. The United States lines have made material reductions to take effect December 5, 1922, from St. Louis and Kansas City territory, Chicago and Milwaukee territory and from Colorado common points, Denver and South, to border cities, on traffic destined to various cities and towns within Mexico.

The National Railways of Mexico reduced freight rates, effective October 5, 1922, on all commodities imported into

Mexico through Ciudad Juarez, Chid., Piedras Negras, Coah, Nuevo Laredo and Matamoros, destined to Mexico, Queretaro, Monterrey, Saltillo, Enccantado and Tampico. The reduction averaged about 40 per cent.

Bulletin No. 12, Traffic Department, Glass Container Association, states that J. T. Hendricks, traffic director, has made arrangements whereby the Department of Car Service of the Interstate Commerce Commission will, by the arbitrary assignment of box cars, co-operate with the manufacturers of glass containers (especially those supplying the food and drug trade) in preventing emergencies from arising in connection with the movement of glass sand. This is to relieve any situation where the carrier or carriers—as the case may be—are themselves powerless to provide equipment in such instances. The understanding is that when any of the Association members clearly foresee trouble brewing and are advised of the carriers' inability to overcome it, the traffic men shall be notified and will, in turn, notify the proper individual at Washington, who will apply the remedy as indicated.

Verified News of Trade Activities

The Refugio Glass Works has been incorporated at Refugio, Texas, with a capital of $75,000 by W. M. Stephenson, James K. Naylor and W. L. Napier.

The Automatic Glass Products Company, Toledo, O., has been incorporated with a capital of $150,000 by Charles H. Lemmon, Milo J. Warner, Robert Newbegin, Ellery G. Bean and Richard D. Logan.

The Sheffield Glass Bottle Company, Sheffield, Pa., is making improvements to its factory at a cost of $100,000, and when completed the plant will have a capacity of about six carloads of bottles per day.

The Primax Glass Company, New York, N. Y., has been incorporated with a capital of $5,000 by F. S. Lust, R. Markowitz and M. Guth. Myers & Sherwin, 299 Broadway are attorneys for the new company.

The Star Glass and Supply Company, Fostoria, O., has been incorporated with a capital of $50,000. The incorporators are: Clyde Keltner, Harry E. Keltner, E. M. Keltner, Raymond Wagner, F. H. Keltner and E. M. Mumma.

L. E. Alley, president of the **Alley Glass Company,** operating a cut-glass ware plant at Shinnston, W. Va., announces that the company will not erect a new $300,000 glass factory as reported but will enlarge its present factory.

The Midway City Glass Corporation, Huntington, W. Va., has been incorporated with a capital of $50,000, to manufacture glass products. The incorporators are B. W. Walton, N. Christian and R. T. Morris, all of Huntington.

The Pennsylvania Wire Glass Company is erecting a new steel producer house at its plant at Dunbar, Pa., which will be equipped with a Wiederholdt stack, coal handling machinery, an R. D. Wood automatic gas producer, etc.

Fire at the **Gayner Glass Works,** Salem, N. J., on October 27, totally destroyed two main packing houses, three smaller ware sheds and the box factory, at an estimated loss of about $100,000, which was mainly confined to finished product ready for shipment.

The Cannone Glass Products Company, Inc., Caney, Kans., has been incorporated with a capital of $15,000 by J. A. Winkler, president and W. G. Twyman, secretary and treasurer. The company will manufacture glass cylinders for gasoline pumps and five gallon bottles.

The Owens Bottle Company, Toledo, O., has awarded the contract to the Devore Company, also of Toledo, for a one-story, 300 by 360 feet factory addition to its plant at Charleston, W. Va. The addition will be of steel and reinforced construction, and it is estimated will cost $150,000.

The Zenor Bottle Company, which was recently incorporated with a capital of $50,000 to take over a glass plant at Fort Smith, Ark., announces that it expects to begin the production of bottles about December 1. New equipment has been installed in the plant. The officers of the company are: C. P. Zenor, president, and James B. McDonough, vice-president.

The Pioneer Window Glass Company, Marietta, O., has been purchased by John B. Yates, vice-president of the Premier Window Glass Company, Pennsboro, W. Va. Repairs are being made to the Marietta plant which will be completed not later than January 1, when fires will be started and glass blowing commenced on January 29, the beginning of the second period.

The Monroe Glass Company, Inc., recently organized with a capital stock of $25,000 to manufacture lamp chimneys, through E. J. Guisinger, secretary and treasurer, announces that they will operate about December 1. The officers of the company are: John A. Rosenberger, president; John Hartman, vice-president; E. J. Guisinger, secretary and treasurer; Hugh Magee, general manager.

Directors of the **Libbey-Owens Sheet Glass Company,** Toledo, O., declared a dividend of 1¾ per cent. on preferred stock and 2 per cent on the common stock, payable December 1, to stockholders of record, November 21. This is at the rate of $1.75 per share of preferred and 50 cents a share on the common. The dividend payment on the common stock will make a total of 8 per cent for the year.

Three Wheeling, W. Va., district banks absorbed the entire $800,000 issue of the **Kearns-Gorsuch Bottle Company's** bonds endorsed by the **Hazel-Atlas Glass Company,** Wheeling, W. Va. Proceeds will be used to complete the factory started about two years ago by the Kearns-Gorsuch Bottle Company at Zanesville, O. The construction work on the plant was stopped during the period of depression and work was commenced again last May and it is expected that it will soon be completed and the factory put into operation.

Announcement has been made by James Austin, Jr., chairman of the stockholders' committee of the **Modern Glass Company,** Toledo, O., regarding a plan for reorganization. It is proposed to form a new company and issue $500,000 of new bonds of which $300,000 will go to the creditors and $200,000 be sold to provide working capital. The plan also contemplates giving all old stockholders share for share in the new company's no par value stock. Every purchaser of a $100 bond will receive a bonus of ten shares of no par value stock in the new company.

The Monongah Glass Company, Fairmont, W. Va., has arranged for the transportation of coal from their mine at White Rock, W. Va., to the plant, a distance of four miles, over an interurban electric line of the Monongahela Power and Railway Company. This project requires the construction of 1,800 feet of track extension and the purchase of four standard railroad steel hoppers. The Monongah Glass Company owns 706 acres of 5-foot coal at White Rock and expects to mine it for use in their producer plant, and after the completion of the track extension will not be dependent upon the railroad car supply nor upon the condition of the coal market.

A. H. Heisey & Company, Newark, O., have sent notices to the trade calling attention to a decision granted in favor of the Company by Judge John E. Sater of the United States Court for Southern District of Ohio, sustaining the company's claims against the Imperial Glass Company, Bellaire, O., for infringement of patents covering a line of nappies known as their No. 393 and 393½. The notice warns the trade that any nappies similar to their No. 393 line, manufactured, sold, bought, or re-sold by anybody, whether manufacturers or dealers shall make such dealer, or manufacturer, liable under this decision and assert their intention of protecting their interests in the matter.

John Foerst & Sons, Bayonne, N. J., manufacturers of fuel oil burners, and engineers for complete installations of oil burning equipment, have engaged the services of W. G. Edmonds, Clyde, N. Y., who is well known in the glass trade, to look after their business with the glass manufacturers. John Foerst & Sons have been engaged in the manufacture of fuel oil burners for the past thirty years. They make oil burners for many uses including pot furnaces, continuous tanks, day tanks, lehrs, glory-holes, etc. Mr. Edmonds has been engaged in the glass manufacturing business for over twenty years, having worked in most of the branches, making

glass from pot furnaces, tanks and day tanks where both producer gas and fuel oil have been used. Eight years of experience with fuel oil has given him good opportunities for making a study of its use.

The O'Neill Machine Company, Toledo, O., are now occupying their new factory building at 2090 Auburn avenue. The building is of the latest "daylight" construction, 60 feet by 180 feet, of brick and concrete, and is located in one of the best factory districts in Toledo, with plenty of ground available for additional units. The capacity of the new plant will be 10 to 12 four-ton machines a month. The company, which was started ten years ago with six employees, now has over 100, and has placed more than 800 machines in the glass houses of the country. Frank O'Neill, inventor of the bottle-making machine, is president of the Company; Wilson M. O'Neill, vice-president, and F. E. H. Jaeger, secretary.

The Inland Glass Company, Chicago, Ill., has been incorporated with a capital stock of $750,000 to manufacture all kinds of illuminating glassware. A plant is being erected at Clearing Industrial District, just outside of the southwest limits of Chicago, that will consist of a main building, 475 by 190 feet, and buildings for storage of material and warehousing of product. Furnaces, lehrs, etc., are being constructed by the H. L. Dixon Company, Pittsburgh, Pa., and will be of the most modern type. Modern equipment, machinery, etc., representing the latest developments in the manufacture of glassware, labor saving devices of all kinds are also being installed. The officers of the new company are: president, J. B. Weaver, formerly vice-president of the Pullman Company, will be in charge of manufacturing; vice-president, E. M. Stevens, formerly connected with the Street Lighting Equipment Company; secretary-treasurer, H. P. Withers; plant manager, Fred W. Stewart, and superintendent, Ernest W. Fogel, both formerly with the Phoenix Glass Company.

Owens Bottle Report

The Owens Bottle Co., Toledo, O., report for nine months ended September 30, 1922, net profit of $2,953,333 after expenses and federal tax, equal, after preferred dividends, to $3.53 a share ($25 par) on $17,371,900 common, against $1,485,865 or $1.42 in the same period 1921.

Consolidated income account of Owens Bottle for nine months ended September 3, 1922, compares as follows:

	1922.	1921.	Increase.
Manufacturing profits and royalties	$3,477,935	$2,060,321	$1,417,614
Other income	1,008,898	751,015	257,883
Total income	4,486,833	2,811,336	1,675,497
General expense, etc.	1,180,200	1,095,471	84,729
Net earnings	3,306,633	1,715,865	1,590,768
Estimate Federal Tax	353,300	230,000	123,300
Net profit	2,953,333	1,485,865	1,467,468

Personal News

C. Nick Muessig, for 20 years in charge of the East Liverpool office of B. F. Drakenfeld & Company, Inc., dealers in chemicals and colors for the glass industry, will shortly return to the home office in New York to take charge of some special work there. Mr. Muessig will be succeeded at East Liverpool by William Malkin, who has for some years past had charge of the Drakenfeld Company's interests in the Wheeling, W. Va., district.

Deaths

I. W. Richardson, vice-president of the North Baltimore Bottle Glass Company, Terre Haute, Ind., died on November 1 from blood-poisoning. Mr. Richardson's business connections with the glass company began in North Baltimore, Ohio, in 1887, when he entered the firm as secretary. The firm moved from Ohio in 1895 to Auburn, Ind., and in 1900 located at Terre Haute. Mr. Richardson is survived by his widow, two sons, one daughter and three sisters.

Isaiah D. Morgan, vice-president of the Paden City Glass Company, Paden City, W. Va., died at his home in New Martinsville, W. Va., on October 31. Mr. Morgan is survived by his widow and four children.

Business Publications

Bristol's Pyrometers. New catalog, No. 1401, of the Bristol Company, Waterbury, Conn. A 68-page catalog describing and illustrating the Bristol thermo-electric low and high resistance pyrometers, the automatic internal cold-end compensator used with Bristol pyrometers, various models of indicating and recording pyrometers, multiple fire-end recording pyrometers, and various appliances and accessories. Besides temperature measuring devices, the company manufactures an extensive line of recording instruments for pressure and vacuum, liquid level, electricity, time, motion, speed.

Inquiries Received

For further information address THE GLASS INDUSTRY

99.—We are looking for a good line of cheap blanks for light cutting. At present we are in need of such items as ice tea sets, mayonnaise sets, sugar and cream sets, candy jars, cake plates and three-footed bowls. Kindly put us in touch with firms manufacturing such blanks.

100.—Do you know of any glass that will pass a higher per cent of the short wave lengths of ultra-violet than uviol glass? Who jobs uviol glass, or a better glass for ultra-violet filtration, in America?

101.—Kindly give us addresses of concerns which can flash glass in different colors. The quantity of articles needed is not large and it will not pay us to have them made from natural colored glass.

Opportunities for the sale of glass working machinery are referred to in the article in this issue on "The Glass Industry of Chile."

Stock Quotations

(Reported by Moore, Leonard & Lynch, Frick Building, Pittsburgh, Pa.)

PITTSBURGH STOCK EXCHANGE, NOV. 24, 1922.

	Bid	Asked	Last
American Window Glass Machine, com.	85	88	86
American Window Glass Machine, pfd.	..	95	94
American Window Glass Preferred	107	..	107
Pittsburgh Plate Glass	185	200	185
U. S. Glass	..	46	46

With the exception of some activity in Pittsburgh Plate Glass, the market for the past month has been quiet and orderly. The activity in Pittsburgh Plate Glass was in anticipation of favorable dividend action. This expectation was fulfilled by the recent declaration of the regular 2 per cent dividend with a 5 per cent extra cash disbursement. It is also announced that on January 29 a meeting will be held to pass upon an increase in capitalization to $50,000,000, so that a 30 per cent stock dividend can be distributed. This announcement indicates the general condition of the glass industry and it is reported that practically all of the companies will report earnings for this year well above previous figures.

WHEELING STOCK EXCHANGE, NOV. 24, 1922.

	B'd	Asked	Last
Hazel-Atlas	159	161	160
Imperial Glass	95	100	95
Fostoria Glass	118	..	118
Central Glass	90	95	100

A quiet tone prevailed on the Exchange throughout the month. The various glass issues maintained an even price level. Hazel Atlas and Fostoria were the strongest issues. No announcements of importance were made during the month and the earning figures for the current year are awaited with much interest.

TOLEDO STOCK EXCHANGE, NOV. 24, 1922.

	Bid	Asked	Last
Owens Bottle Machine, common	36⅛	..	36⅛
Owens Bottle, preferred	106⅛	110	105½
Libbey-Owens Sheet Glass, common	122	128	122
Libbey-Owens Sheet Glass, preferred	107	..	107

Current Prices of Glass-Making Materials

From quotations furnished by various manufacturers and dealers

November 24, 1922

	Carlots	Less Carlots
Aluminum hydrate ($Al(OH)_3$)..lb.	.05	.05½
Aluminum oxide (Al_2O_3).....lb.	.05½	.06½-.07
Antimony oxide (Sb_2O_3).. ...lb.	.07-.08	.08-.10
Arsenic trioxide (dense white), 99% (As_2O_3).....lb.	.12-.13½	.14
Barium carbonate ($BaCO_3$)...ton	75.00	90.00
Barium hydrate ($Ba(OH)_2$)....lb.	.05½	.05½
Bone ash .....lb.	.05	.06
Borax ($Na_2B_4O_7 10H_2O$) .....lb.	.05½	.06
Borax, fused, any mesh ($Na_2B_4O_7$) .....lb.	.19	.20
Boric acid, fused (B_2O_3).....lb.	.35	.35
Cadmium Sulphide, red (CdS)..lb.	..	1.65
Cadmium Sulphide, orange.....lb.	..	1.65
Cadmium Sulphide, yellow (CdS) .....lb.	..	1.90
Chrome oxide .....lb.	.34	..
Cobalt oxide, in bbls. (Co_3O_4)...lb.	..	2.10
Cobalt oxide, in 10 lb. tins (Co_3O_4) .....lb	..	2.20
Copper oxide, red .....lb.	..	..
Copper oxide, black (CuO).....lb.	..	.26
Copper oxide, black prep'd (CuO) .....lb.	..	..
Cryolite (Na_3AlF_6) .....lb.	..	.09½
Feldspar, 100 mesh.....ton	15.00	25.00
Fluorspar, powdered white, 95% (CaF_2) .....ton	35.00	45.00
Fluorspar, powdered white, 90% (CaF_2) .....ton	33.00	38.00
Hydrofluoric acid (HF) 60%..lb.	.13	..
Kaolin .....ton	17.00	25.00
Lead oxide (red lead) (Pb_3O_4)..lb.	.10⅛	.10½
Litharge (PbO) .....lb.	.09⅝	.10
Lime—		
Hydrated (in 50 lb. paper sacks) ($Ca(OH)_2$) .....ton	11.50	..
Burnt, ground, in bulk (CaO).ton	8.00	..
Burnt, ground, in paper sacks.ton	10.00	..
Burnt, ground in 280 lb. bbls. per bbl.	2.10	2.25
Manganese 85% (MnO_2).....lb.	.03¾	.04¾
Nickel oxide, black (Ni_2O_3) for nickel content .....lb.	..	.50
Nickel monoxide, green (NiO) for nickel content.....lb.	..	.50
Potassium carbonate—		
Calcined 90% (K_2CO_3).....lb.	.06¼	.06½
Hydrated 90% (KOH) .....lb.	.06½	.07¾
Potassium nitrate (KNO_3) (gran.) .....lb.	.06½	.06¾
Powdered blue .....lb.	..	.26
Powdered blue (std. formula)..lb.	..	.38
Salt cake, glassmakers, f. o. b. works (Na_2SO_4) .....ton	26.00	30.00-35.00
Selenium (Se) .....lb.	..	1.95.-2.25
Soda ash, 58% dense, 48% basis		
Bulk (Na_2CO_3) .....100 lb.	1.22½	..
Bulk, on contract (Na_2CO_3) 100 lb.	1.17½	..
Sodium nitrate, refined ($NaNO_3$).lb.	..	.04¾-.06¼
Sodium selenite (Na_2SeO_3).....lb.	..	2.35-3.00
Sodium Fluosilicate (Na_2SiF_6)...lb.	.07¾	.08
Sulphur (S) (flowers)—in bbls. per 100 lb.	3.25	3.55-3.80
Sulphur (flowers) Bags per 100 lb.	3.00	3.30-3.55
Sulphur (S) (flour, heavy), in bbls. per 100 lb.	2.50	2.80-3.05
Uranium oxide—100 lb. lots (UO_2) .....lb.	..	2.25
Zinc oxide (ZnO) .....lb.	.07¼	.07½

Monthly Summary of United States Foreign Commerce in Glass

Corrected to November 2, 1922

IMPORTS

	September 1921		September 1922		Nine Months Ending September 1921		Nine Months Ending September 1922	
Glass and glassware:	Quantity	Value	Quantity	Value	Quantity	Value	Quantity	Value
Bottles, vials, carboys, etc., plain, empty or filled, lbs. .....dut.	975,380	$36,245	837,524	$31,091	6,210,151	$268,730	6,020,414	$220,884
Bottles, decanters and other glassware, cut or ornamented .....dut.	.....	137,017	.....	288,534	.....	1,079,056	.....	1,673,190
Optical instruments, including lenses and spectacles .....dut.	.....	94,612	.....	116,145	.....	795,686	.....	931,409
Sheet and plate glass—								
Cylinder, crown and common window glass, unpolished .....lbs. dut.	1,167,264	77,333	3,280,670	157,851	35,608,360	2,039,885	41,592,161	2,090,262
Plate glass, cast, polished, unsilvered, sq. ft. dut.	165,041	97,374	970,813	458,970	1,826,518	1,360,241	6,222,241	2,819,731
Plates or disks, rough cut, for optical purposes .....lbs. free	13,626	21,268	23,921	21,011	572,667	525,940	126,421	106,800
All other.....dut.	.....	196,050	.....	299,568	.....	1,916,076	.....	2,349,382
Total	.....	$659,899	.....	$1,373,170	.....	$7,985,614	.....	$10,191,658

EXPORTS

Glass and glass products (total).....	.....	622,724	.....	681,499	.....	12,176,914	.....	6,296,535
Plate and window glass—								
Window glass, common, box, 50 sq. ft.....	1,996	$15,197	3,528	$20,109	53,989	$430,264	25,570	$136,235
Plate glass, unsilvered, sq. ft.....	157,475	76,900	54,828	28,162	1,855,174	1,125,854	2,004,074	863,607
Wire glass, sq. ft.....	.....	.....	15,374	4,811	.....	.....	188,804	49,892
Other window and plate glass, n. e. s.....lbs.	.....	.....	204,282	22,093	.....	.....	1,421,928	161,776
Glass containers (bottles, vials and jars).....lbs.	.....	188,160	3,998,811	206,728	.....	3,989,579	30,207,595	1,669,631
Table glassware, plain.....lbs.	.....	.....	1,455,745	138,547	.....	.....	8,797,625	967,020
Table and other glassware, cut or engraved....lbs.	.....	10,729	45,283	16,353	.....	146,698	312,460	118,133
Glassware for lighting—								
Lamp chimneys and lantern globes.....lbs.	.....	.....	151,512	27,240	.....	.....	1,054,667	218,527
Globes and shades for lighting fixtures.....lbs.	.....	.....	156,699	37,495	.....	.....	1,106,614	314,097
Lamps and other illuminating devices, chiefly of glass .....lbs.	.....	.....	98,292	27,853	.....	.....	826,324	292,732
Chemical glassware.....lbs.	.....	18,176	21,885	13,103	.....	189,008	221,836	117,775
Electrical glassware, except for lighting.....lbs.	.....	.....	289,250	18,278	.....	.....	1,610,893	124,059
Other glassware, n. e. s.....lbs.	.....	313,562	694,775	120,727	.....	6,295,511	10,113,570	1,263,051

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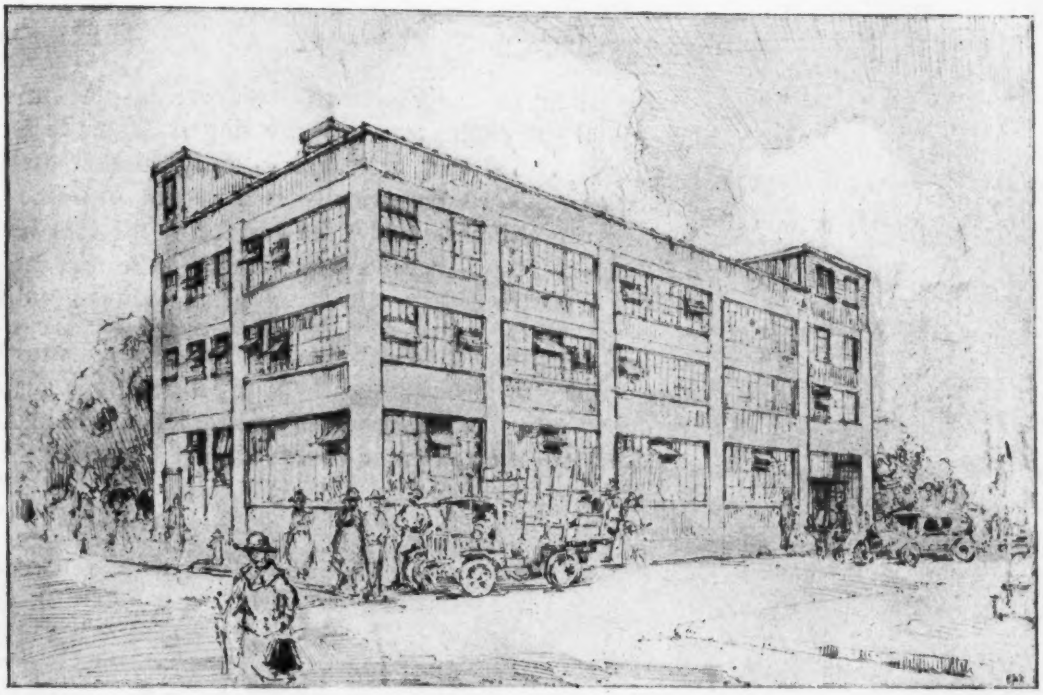

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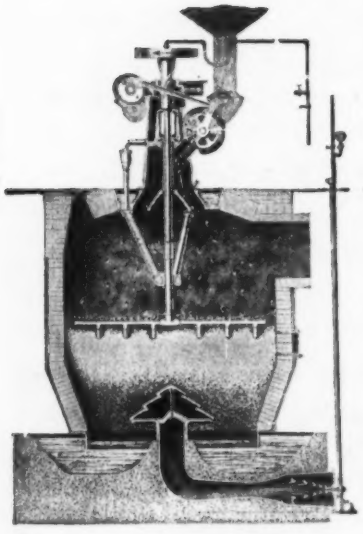

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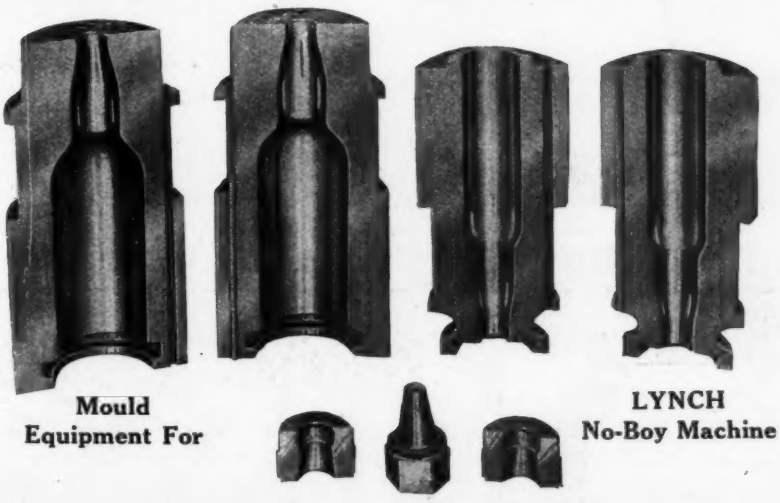

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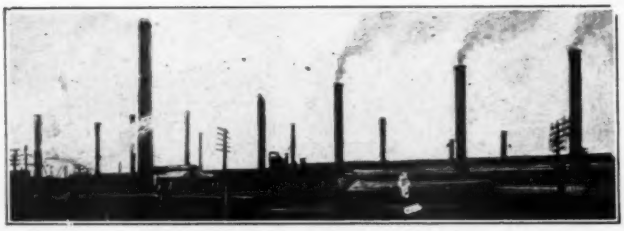

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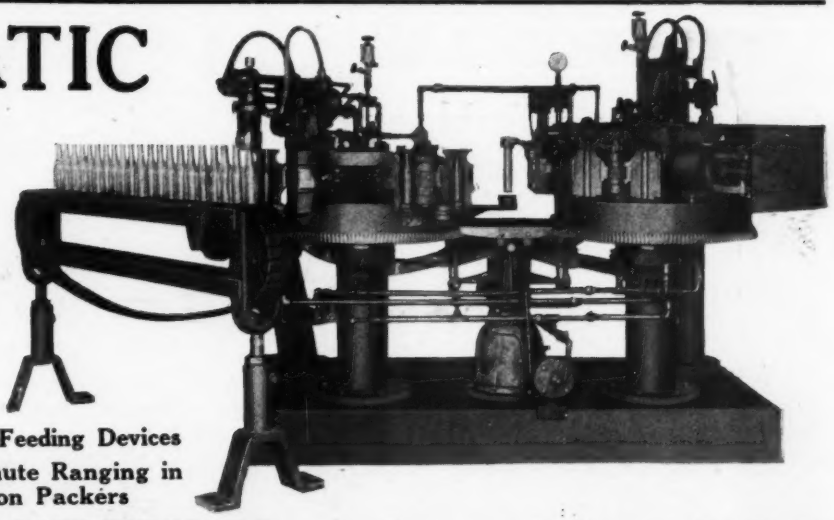

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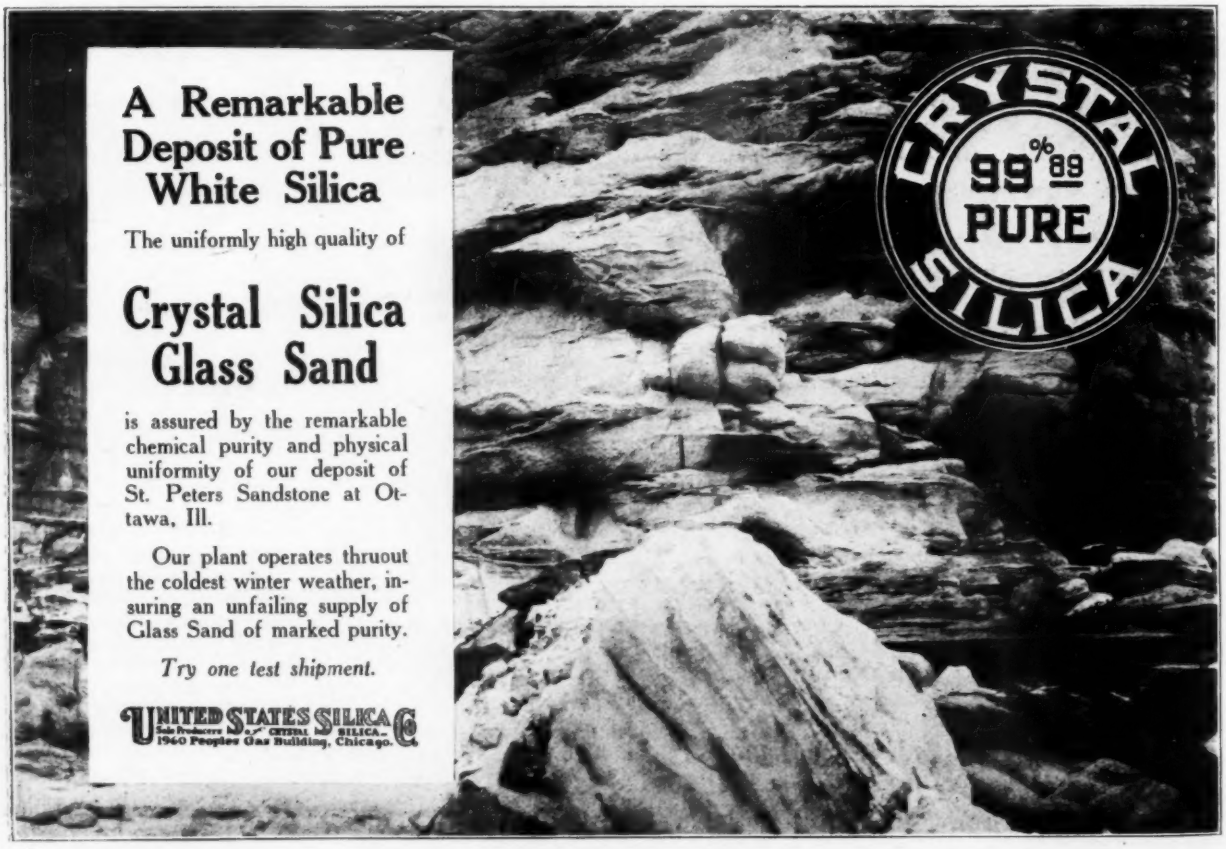

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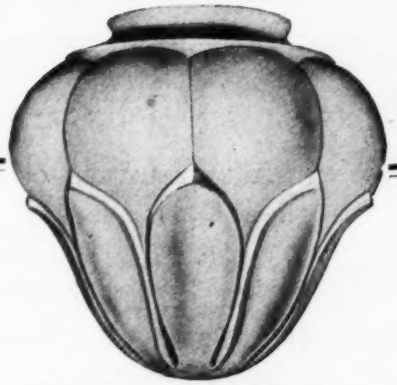

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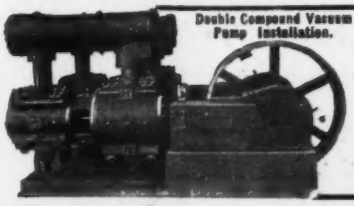
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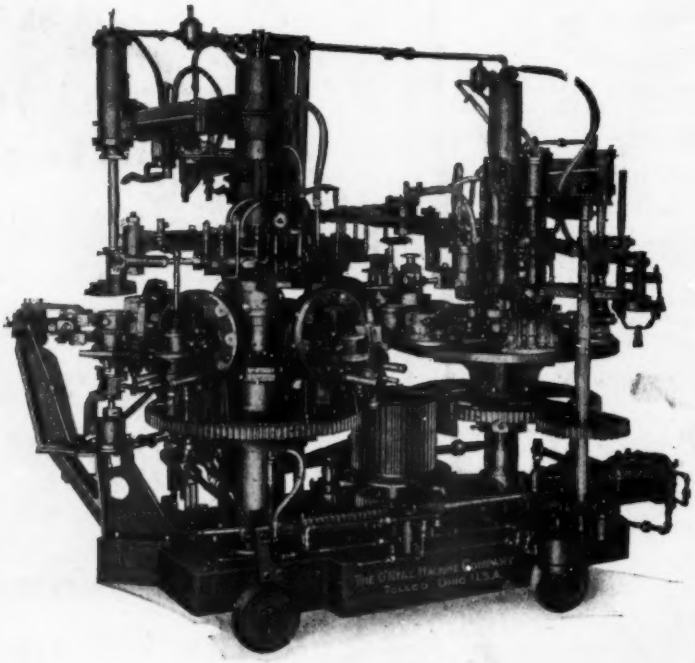

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Vol. 3 NEW YORK, FEBRUARY, 1922 No. 2

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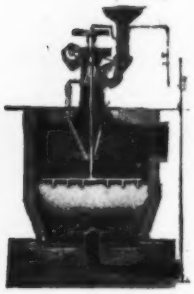

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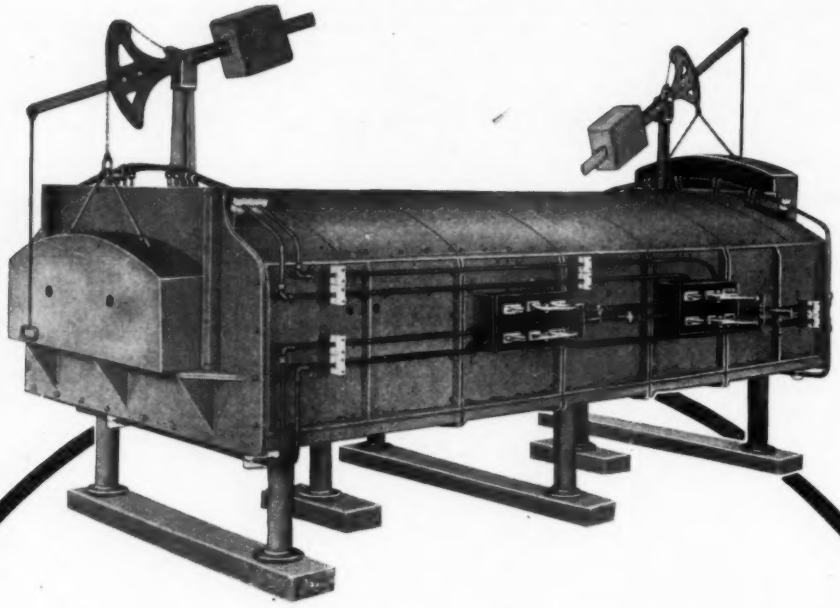

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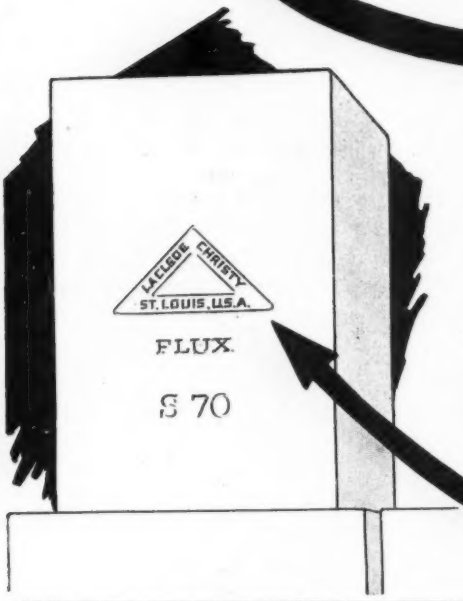

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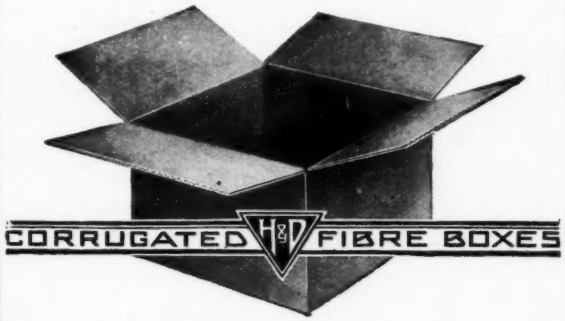

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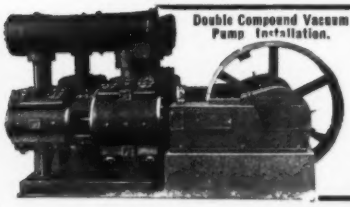

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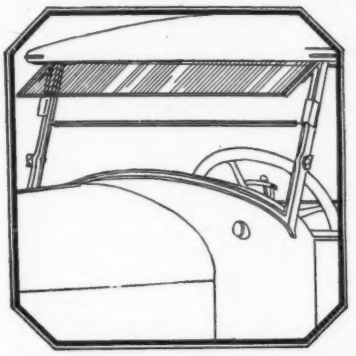

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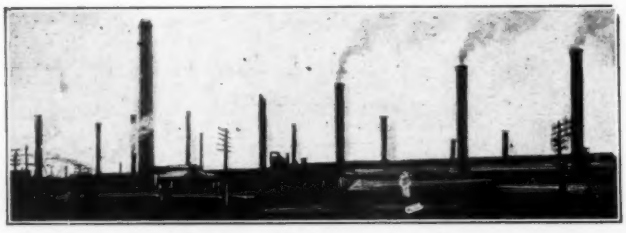

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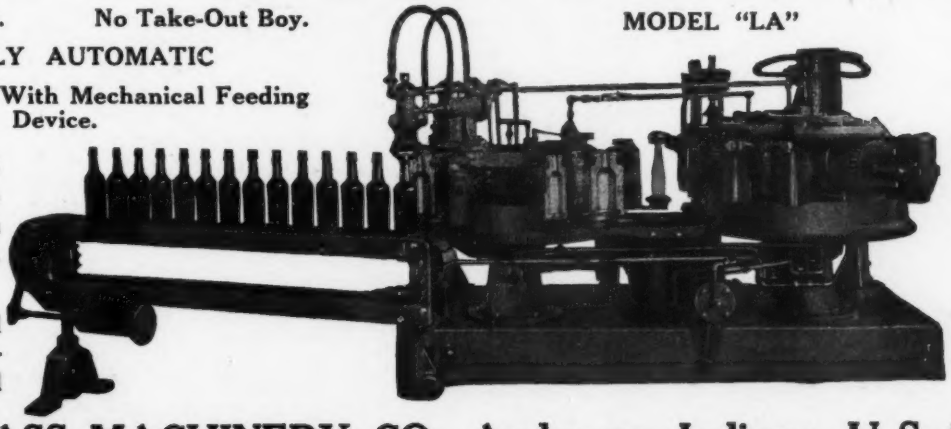

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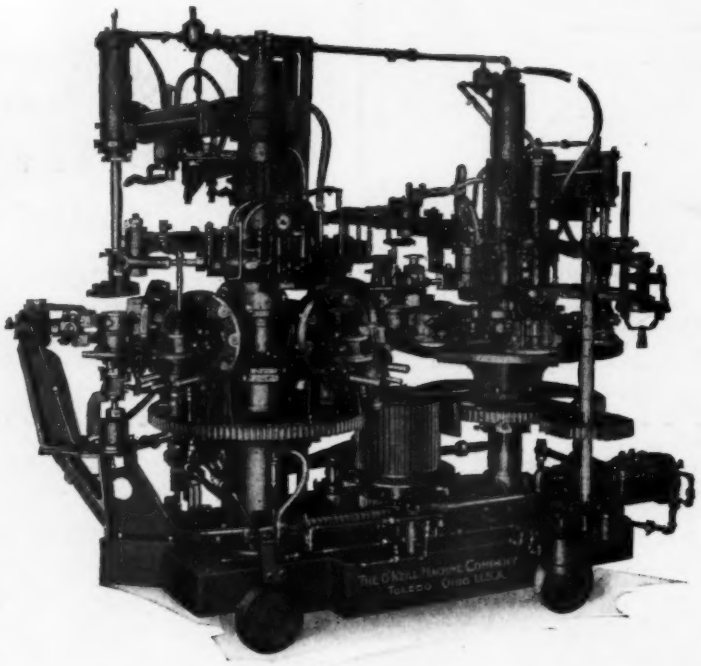

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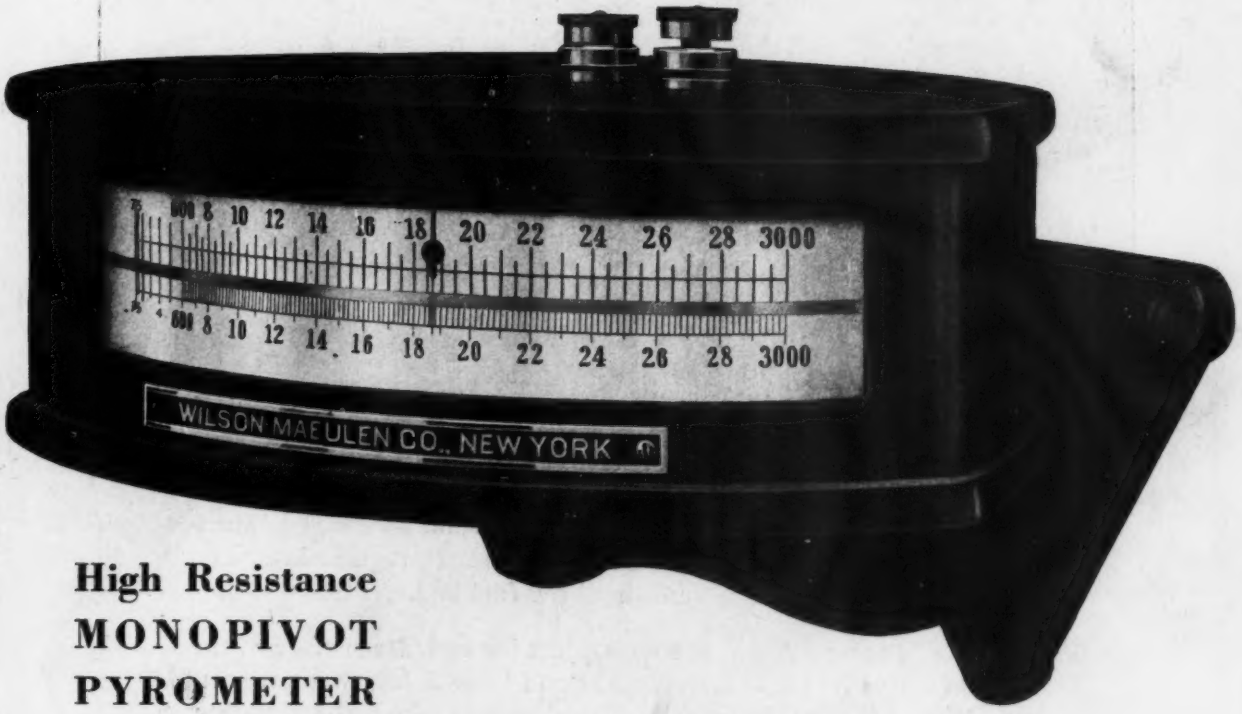

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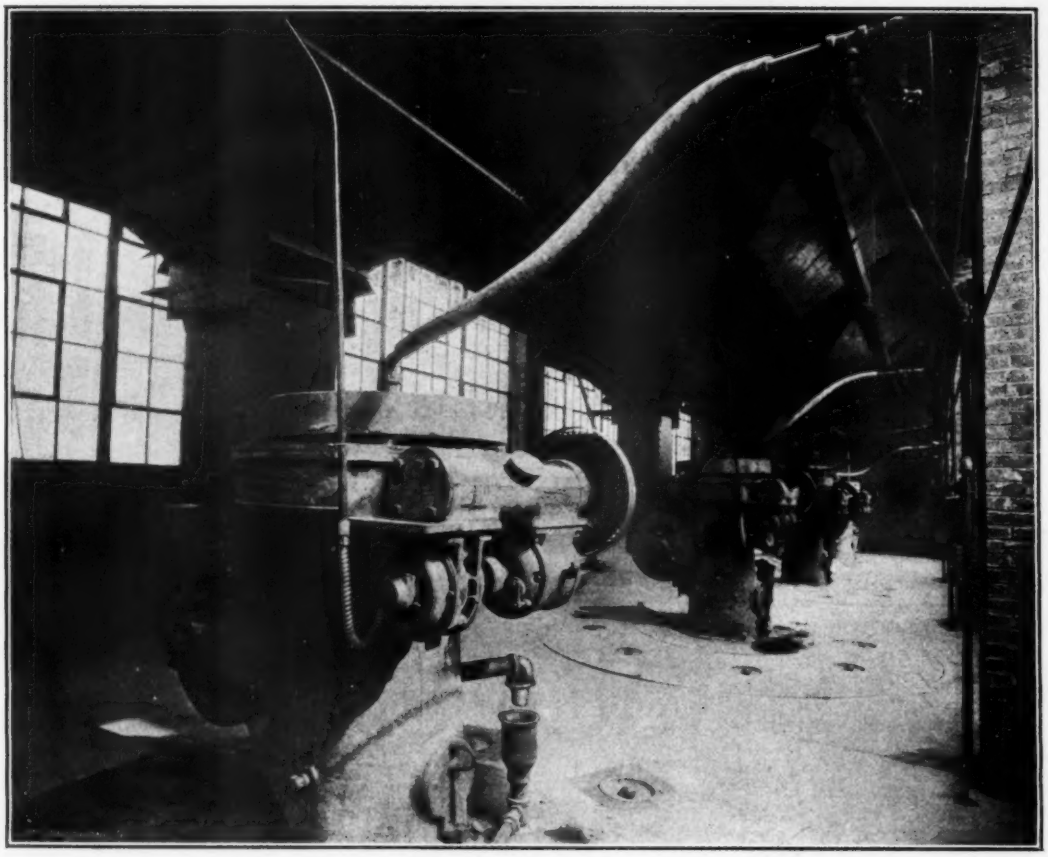

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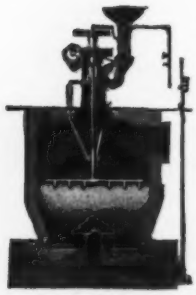

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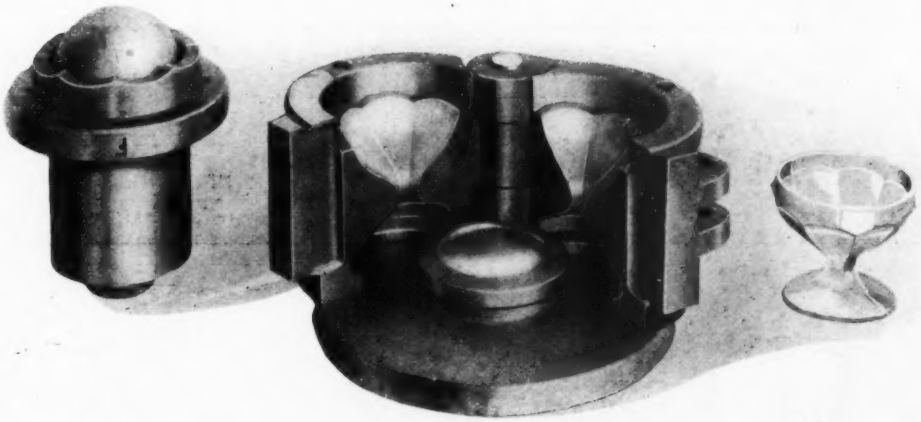

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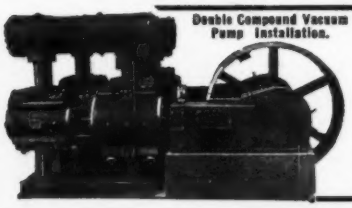
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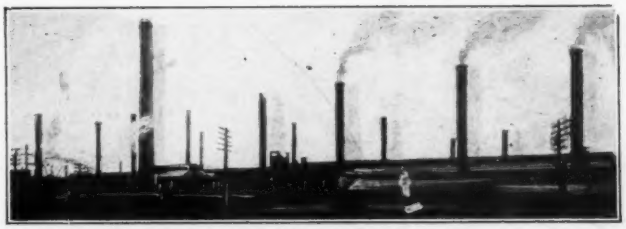

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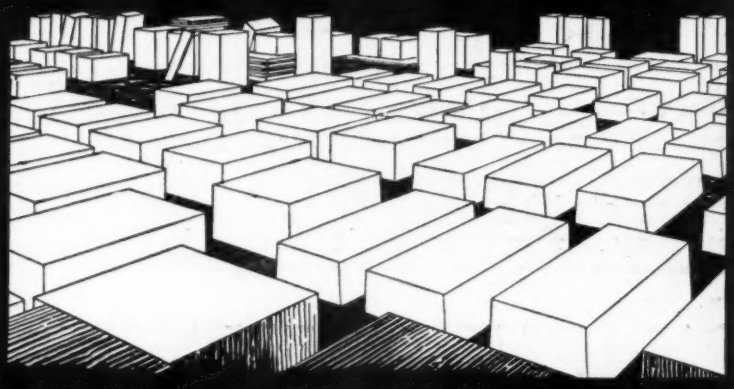

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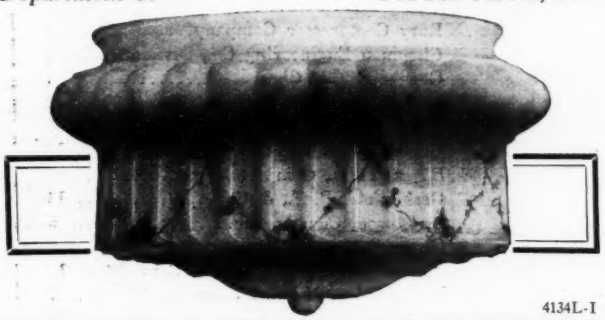

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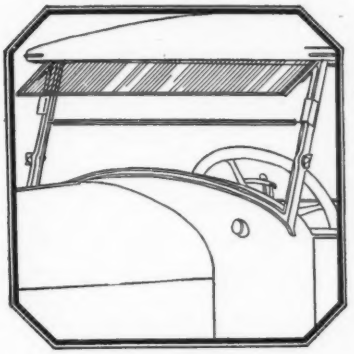

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Colored Glass Specialists

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Point Marion,
Pennsylvania

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Drakenfeld, B. F., & Co., Inc., New York.

MACHINERY, GLASS WORKING (See Glass Working Machinery)

MANGANESE
Cooper, Charles, & Co., New York.
Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.

MIXERS, BATCH (See Batch Handling Systems)

MOLDS, MACHINE AND HAND
Miller Glass Engineering Co., Swissvale, Pa.
Miller Machine & Mold Works, Columbus, Ohio.
O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., The, Albany Works, Trenmar Gardens, Willesden Junction, London, N. W. 10, England.
Toledo Mould Co., Factories Building, Toledo, Ohio.
United Mould Company, The, Toledo, Ohio.

MULTI-RECORDING PYROMETERS
Wilson-Maeulen Co., Inc., 385 Concord Ave., New York.

POT CLAY
Laclede-Christy, St. Louis, Mo.

POWDERED BLUE
Cooper, Charles, & Co., New York.
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.
Sharp-Schurtz Company, Lancaster, O.
Vitro Manufacturing Company, Pittsburgh, Pa.

POWER PLANTS
Simplex Engineering Co., Washington Trust Building, Washington, Pa.
Wiederholt Construction Co., 625 Bank of Commerce Bldg., St. Louis, Mo.

PRODUCER GAS PLANTS (See also Fuel Gas Plants)
Chapman Engineering Co., Mount Vernon, Ohio.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.
Standard Mfg. Co. Corning, N. Y.

PYROMETERS, MULTI-RECORDING AND INDICATING
Engelhard, Charles, Inc., 30 Church Street, New York.
Wilson-Maeulen Co., The, 385 Concord Ave., New York.

REFRACTORIES (See also Fire Brick) Glass House
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Laclede-Christy, St. Louis, Mo.
Russell Engineering Company, St. Louis, Mo.
Willetts Company, The, Pittsburgh, Pa.

REVERSING VALVES, GAS AND AIR
Chapman Engineering Co., Division, Mt. Vernon, Ohio.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
McCamic-Batchell-Bergman Co., Box 6, Station G, Toledo, Ohio.
Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.

SALT CAKE
Grasselli Chemical Co., Cleveland, Ohio.

SAND, GLASS (See Glass Sand)

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Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.
Sharp-Schurtz Company, Lancaster, O.
Vitro Manufacturing Company, Pittsburgh, Pa.

SHIPPING CASES, FIBRE
Hinde & Dauch Paper Company, The, 408 Water St., Sandusky, Ohio.

SODA ASH
Cooper, Charles, & Co., New York.
Solvay Process Co., Syracuse, N. Y.
Wing & Evans, Inc., 22 William St., New York.

SODIUM SELENITE
Drakenfeld, B. F., & Co., Inc., New York.

STEEL STACKS, BINS, TANKS, GAS MAINS
Standard Mfg. Co., Corning, N. Y.

STORAGE BINS, RAW MATERIALS (See also Coal Handling and Storage Systems, and Batch Handling and Mixing Systems)
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Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.
Standard Mfg. Co., Corning, N. Y.
Wiederholdt Construction Co., 625 Bank of Commerce Building, St. Louis, Mo.

TANK BLOCKS
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Laclede-Christy, St. Louis, Mo.
Russell Engineering Company, St. Louis, Mo.
Willetts Company, The, Pittsburgh, Pa.

TANK FURNACES (See Furnaces)

TANKS, STEEL
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Vitro Manufacturing Company, Pittsburgh, Pa.

URANIUM OXIDE
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Harshaw, Fuller & Goodwin Co., Cleveland, Ohio.

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COLORED AND OPTICAL GLASS
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CONVEX GLASS
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GLASS SPECIALTIES
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GOGGLE GLASS
Houze, L. J., Convex Glass Co., Dept. B., Point Marion, Pa.

ILLUMINATING GLASSWARE
Pittsburgh Lamp, Brass & Glass Company, Pittsburgh, Pa.

SHEET GLASS, COLORED
Houze, L. J., Convex Glass Co., Dept. B., Point Marion, Pa.

WINDOW GLASS
Johnston Brokerage Company, Pittsburgh, Pa.

Directory of Advertisers

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Speed 10 to 23 Bottles per minute, ranging in size from 4-oz. to Half-Gallon.

May be worked by hand gatherers.

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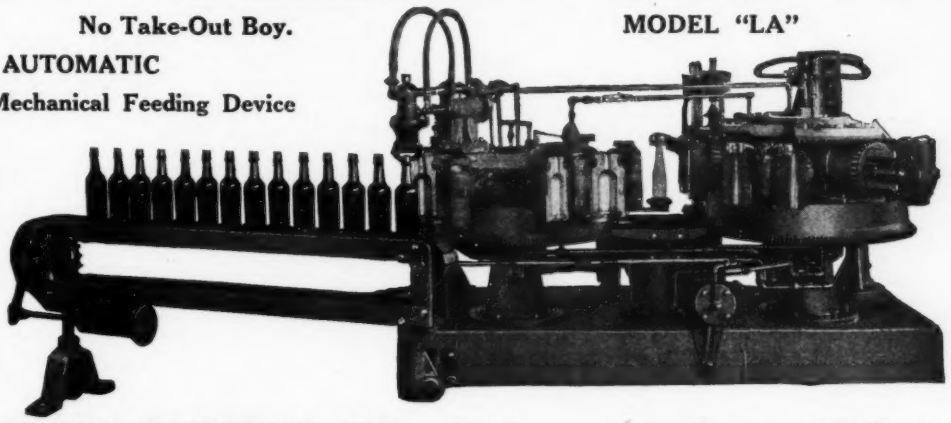

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During a natural gas shortage you've got to keep your cracking-off and glazing machines going or shut down the whole plant.

Be foresighted—install a Tirrill Gas Making Machine. It is an assurance of uninterrupted factory operation, besides being safe, reliable, economical and useful for various other purposes.

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For Glassmakers

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Standard Grades for the Glass Industries
Samples furnished upon application
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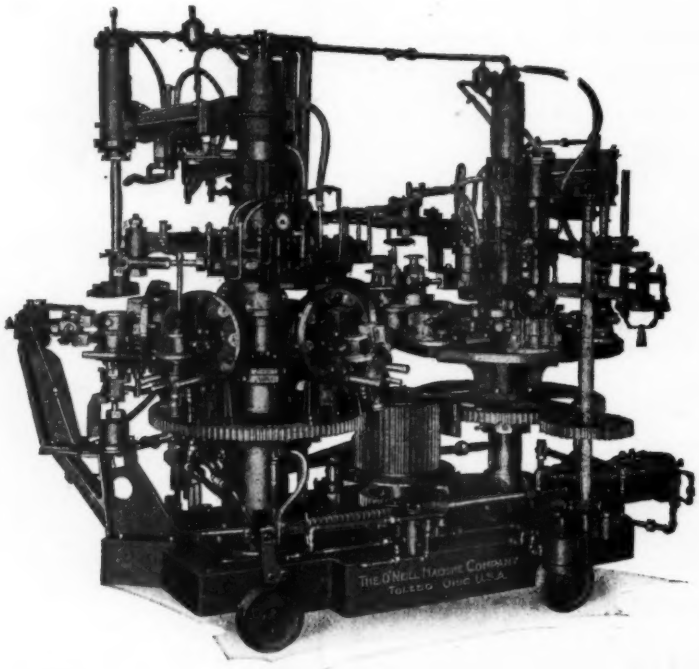
BOTTLE BLOWING MACHINES

Completely Automatic With Any Feeder



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APR 4 1922

The Glass Industry

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The First Technical Trade Journal Devoted Exclusively to Glass
Technology :: Engineering :: Management :: Raw Materials :: Equipment

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19 LIBERTY STREET, NEW YORK

PUBLISHED MONTHLY

$2.00 A YEAR
SINGLE COPY 20 CENTS

Vol. 3 NEW YORK, APRIL, 1922 No. 4

Some consider him the symbol for WRONG, some, the symbol for TROUBLE and some, the symbol for HEAT. Some who are wiser know he is the symbol for all three—TROUBLE through the WRONG HEAT.

The ancients would have thrown a live pig into the furnace to get rid of him for a while.

The moderns install one of our high resistance pyrometers and get rid of him for good and all.

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Makers of the best pyrometers

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Entered as Second-Class Matter August 10, 1921. at the Post Office at New York, N. Y., Under the Act of March 3, 1879. Printed in U. S. A

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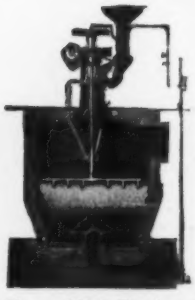
This photograph of an actual installation of Chapman Producers shows the charging floor and overhead coal bins. From these bins, coal passes direct to the feed drum, where it is automatically measured out and distributed, at short, regular intervals, uniformly over the entire surface of the fuel bed.

The Chapman Agitator moving just beneath the surface of the fuel bed keeps it free from hot spots and blow holes, thus preventing the formation of clinkers. This process gives the constant supply of uniformly rich gas so necessary for the production of true quality glass which the highly competitive market of today demands.



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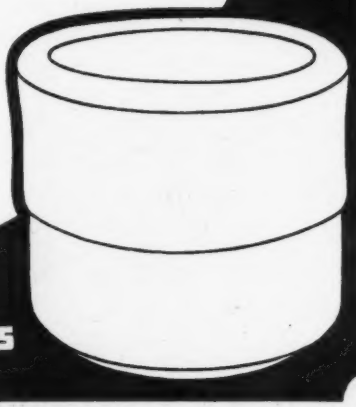

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Mould Equipment for No. 25 O'NEILL NO BOY MACHINE

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FINE MOULDS FOR GLASSWARE FOR ALL TYPES OF MACHINES

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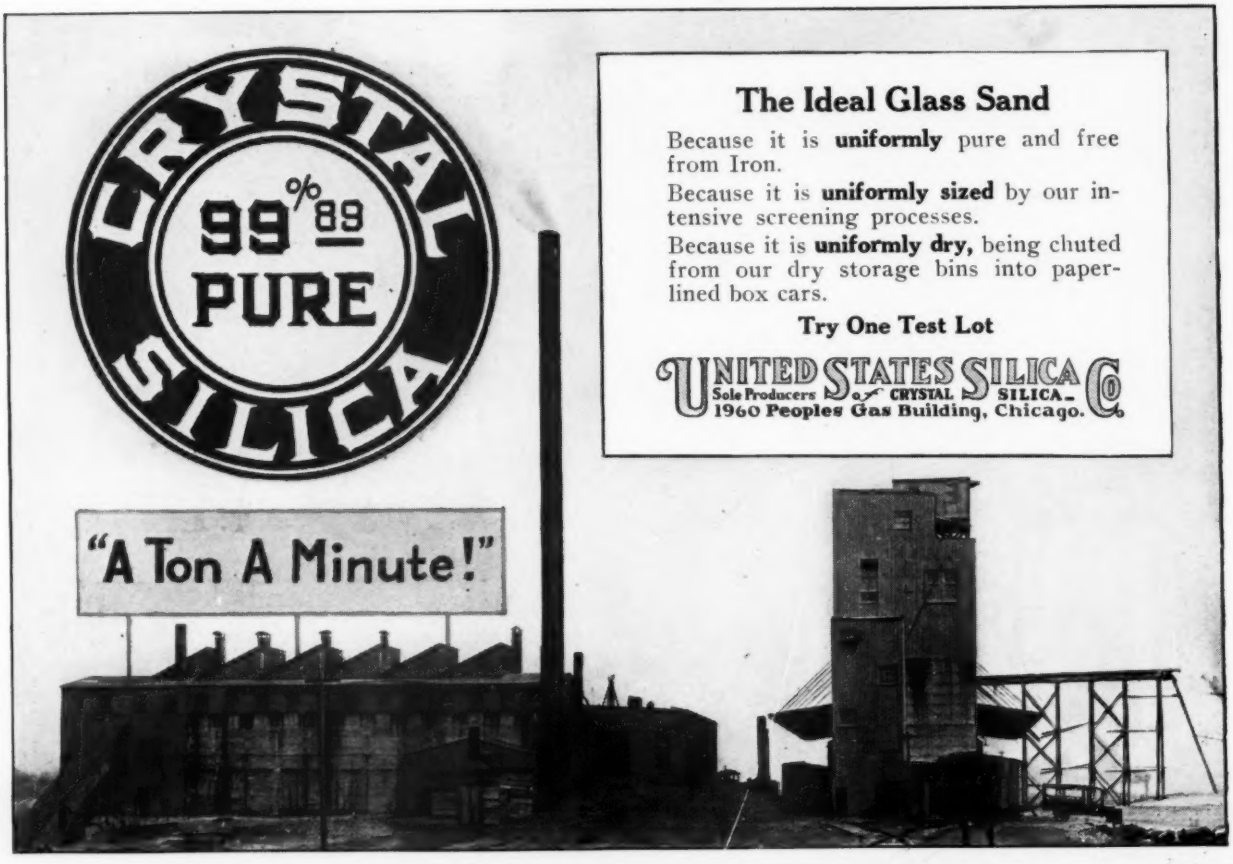

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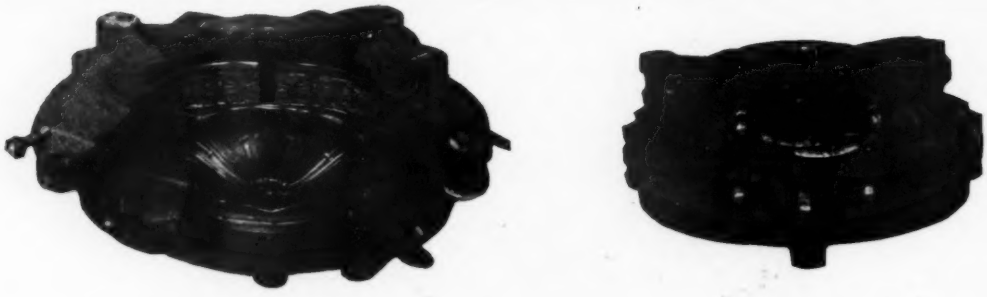

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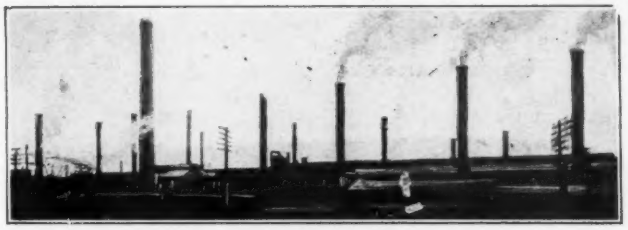

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The application of Producer Gas in Glass Melting cannot be dealt with in quite the simple and certainly not in the wasteful manner used in the past with natural gas.

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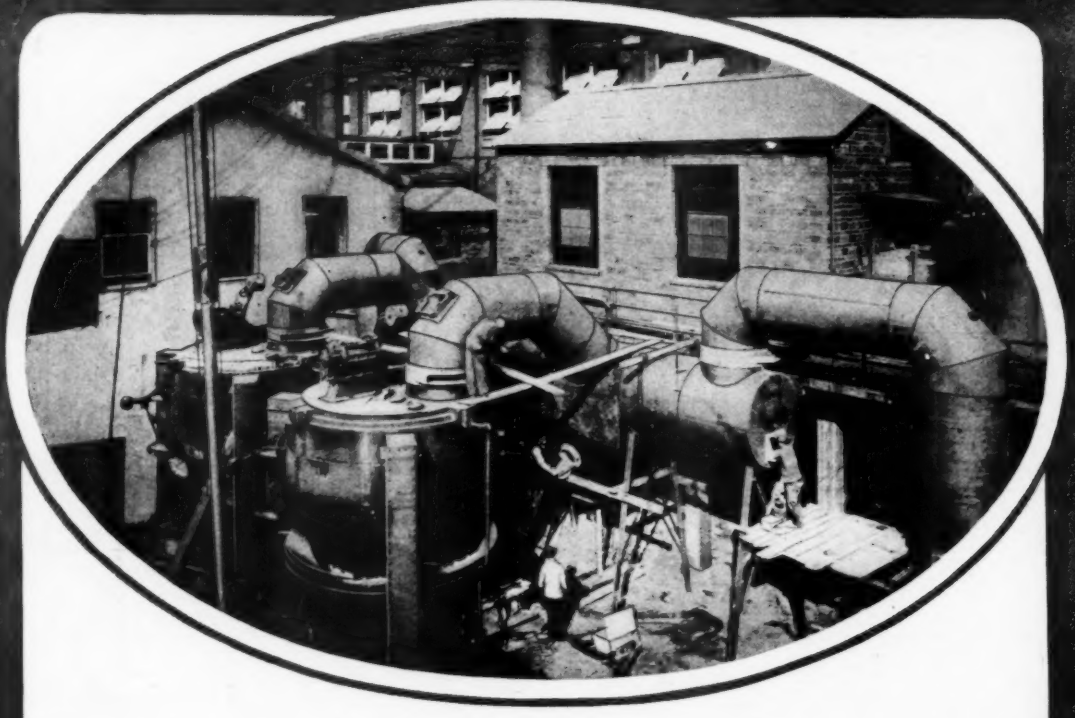
PRODUCER GAS MACHINES

COMPLETELY AUTOMATIC



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SEND US YOUR INQUIRIES; CONSULT US

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It is, in one of the largest glass factories in the world.

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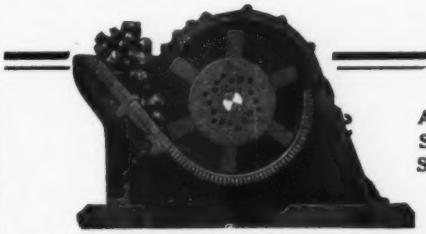

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Williams Glass Crushers

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Producer Gas Plants
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Complete Factories
Labor Saving Devices

For Better Production

MAKING present installations efficient, economical, profitable is the work of our consulting engineers.

We also design, build and install glass house equipment. The plants we have served give ample testimony.

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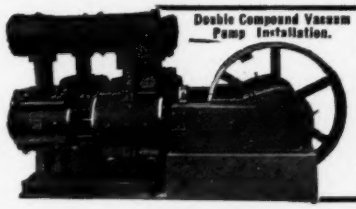

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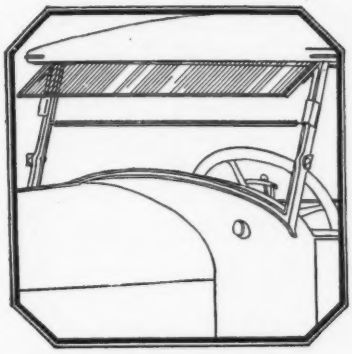

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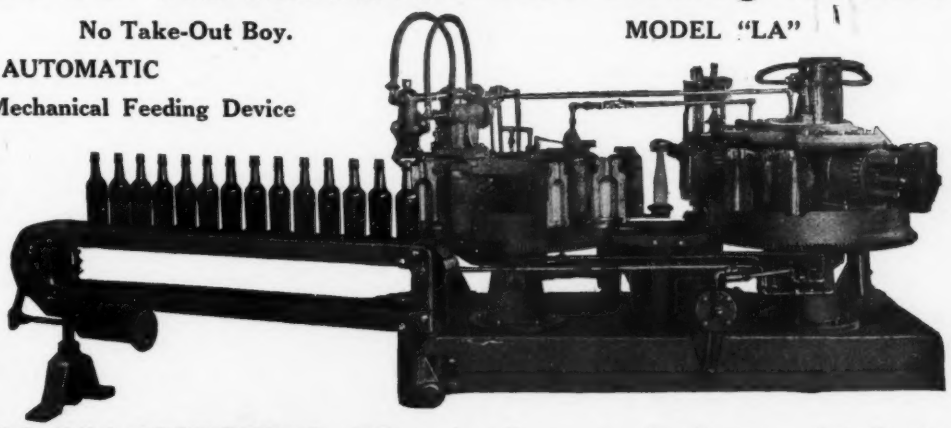

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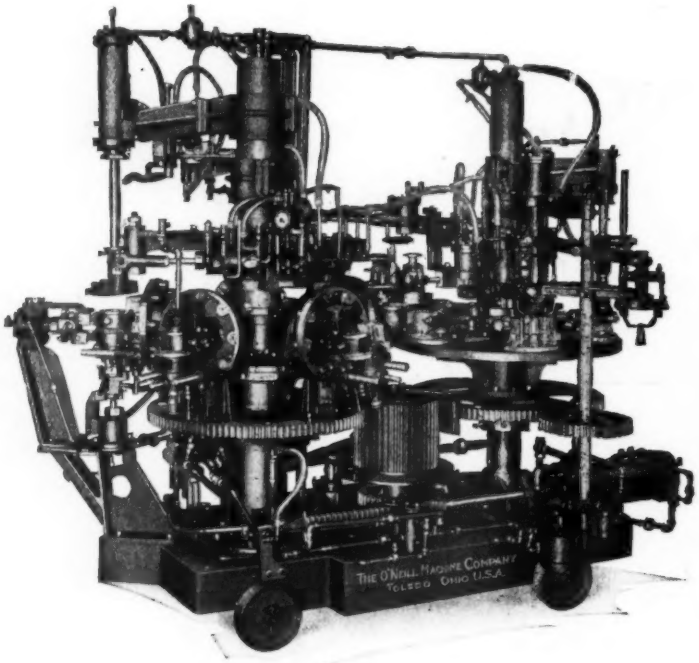

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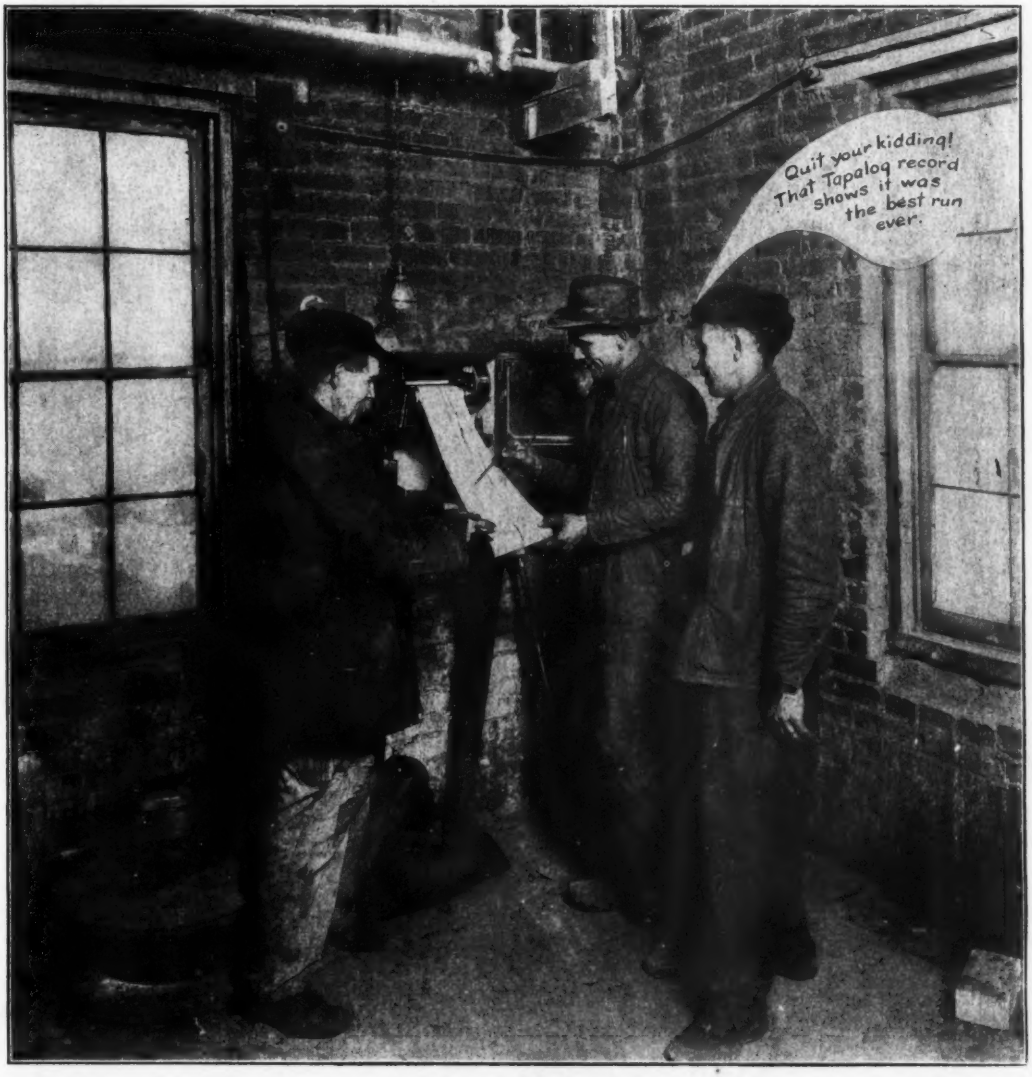

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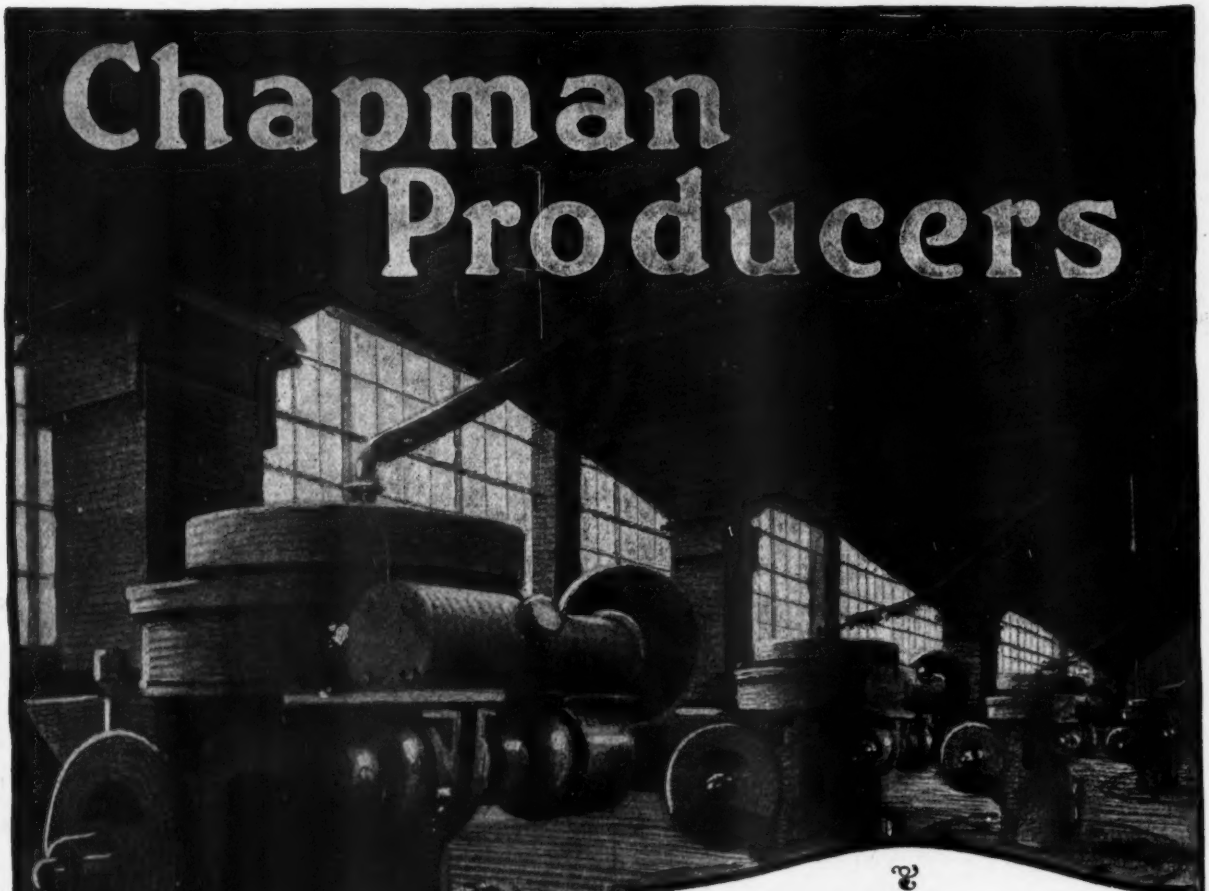

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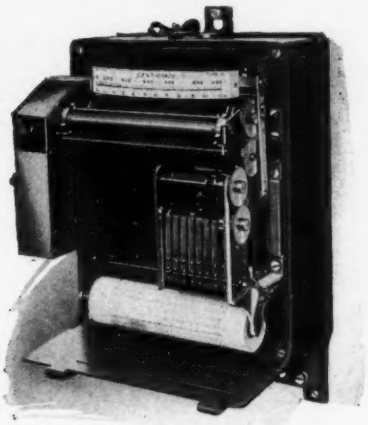

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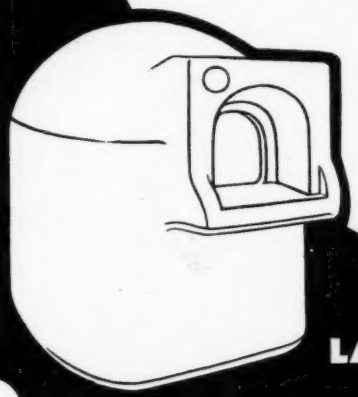

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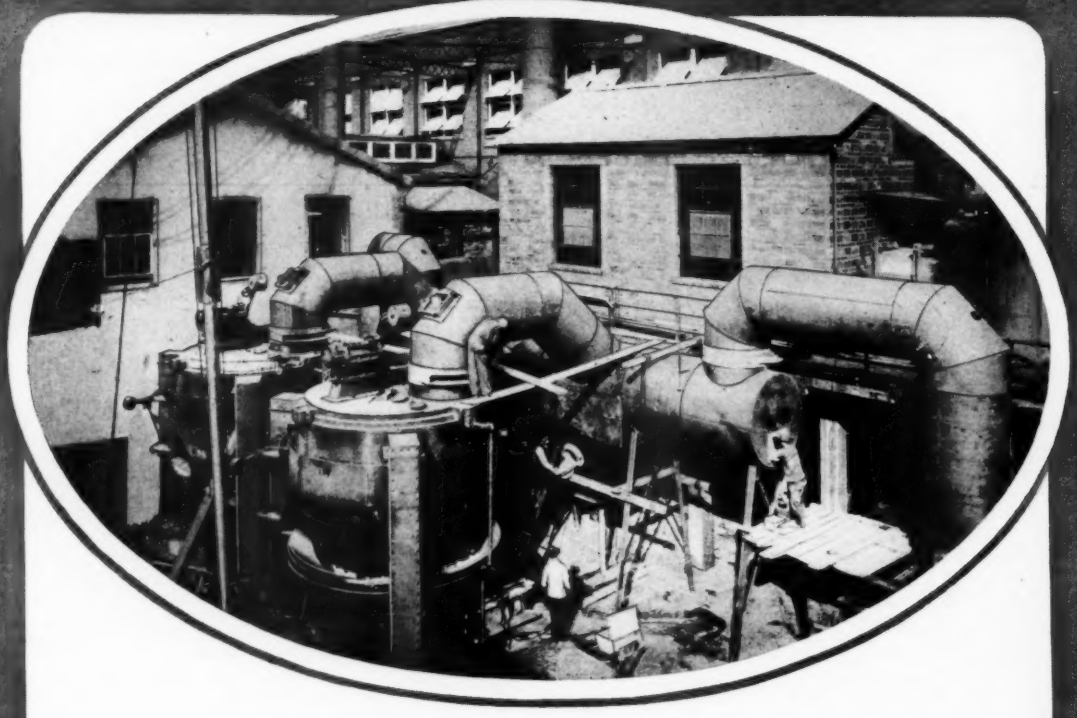

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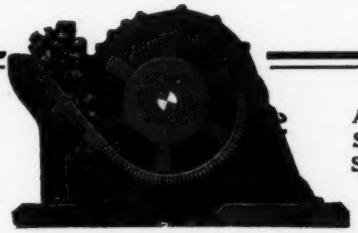

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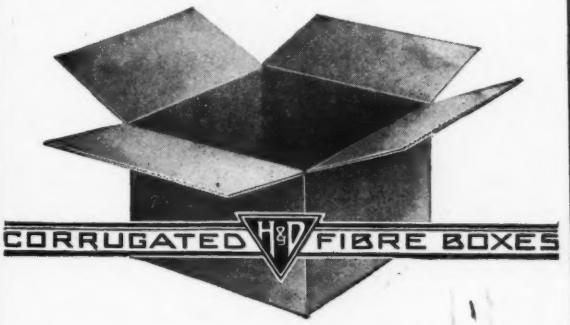

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Of THE GLASS INDUSTRY, published monthly, at New York, N. Y., for April 1, 1922.

State of New York } ss.
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Before me, a Notary Public, in and for the State and county aforesaid, personally appeared G. W. Cooper, who, having been duly sworn according to law, deposes and says that he is the managing editor of THE GLASS INDUSTRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

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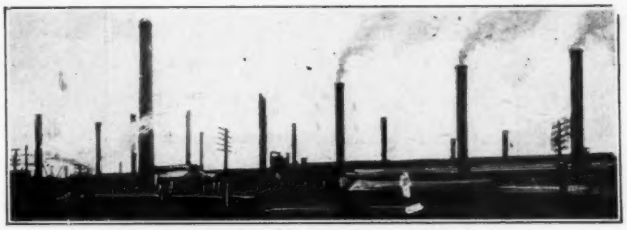

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GASOLINE FUEL GAS PLANTS
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GAS REVERSING VALVES (See Reversing Valves)

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(Continued on page 12)

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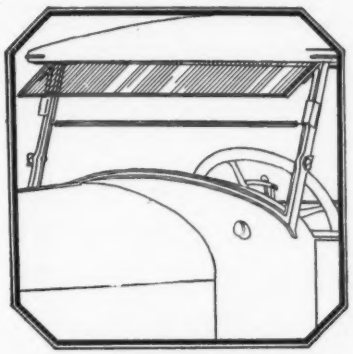

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Wiarda, John C., & Co., Brooklyn, N. Y.
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O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., The, Albany Works, Trenmar Gardens, Willesden Junction, London, N. W. 10, England.
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Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.
Sharp-Schurtz Company, Lancaster, O.
Vitro Manufacturing Company, Pittsburgh, Pa.
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Simplex Engineering Co., Washington Trust Building, Washington, Pa.
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Russell Engineering Company, St. Louis, Mo.
Willetts Company, The, Pittsburgh, Pa.
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Russell Engineering Company, St. Louis, Mo.
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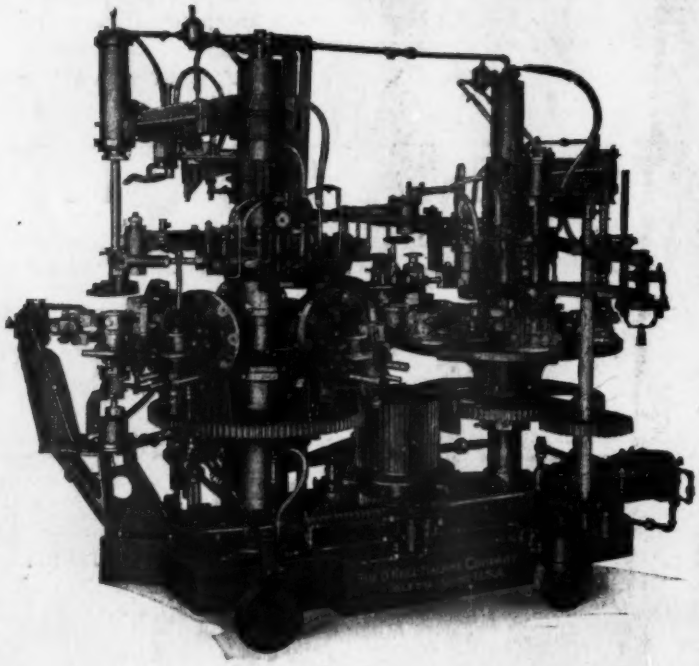

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JUN 8 1922

The Glass Industry

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Vol. 3 NEW YORK, JUNE, 1922 No. 6

Let the first letter you dictate today be a few lines to us to tell us your present or future plans that involve changes or additions to your pyrometer installation.

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385 Concord Avenue
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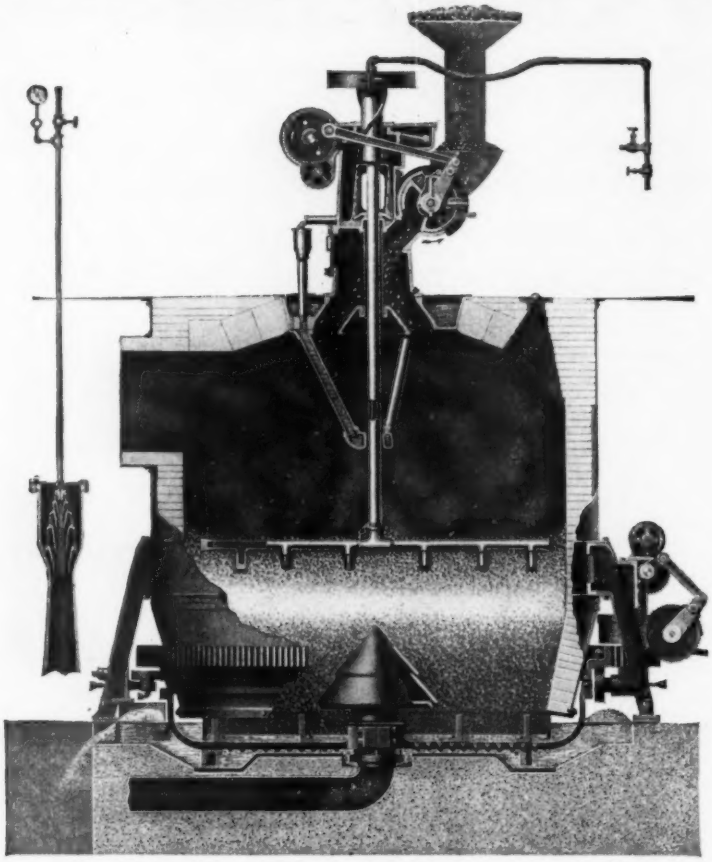

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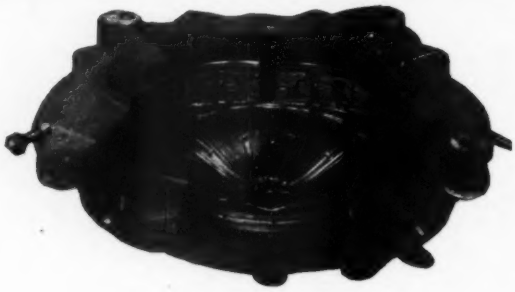

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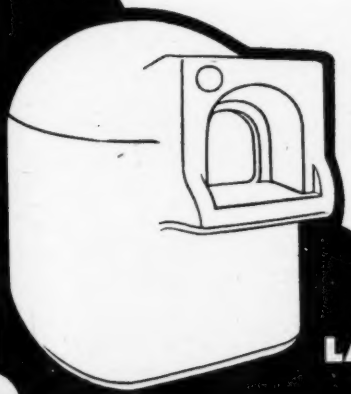

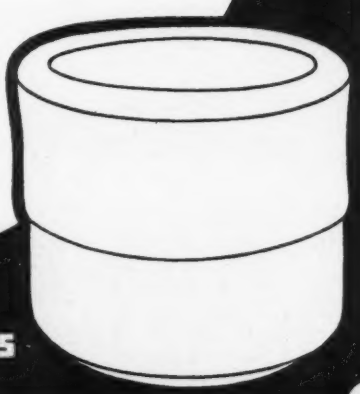

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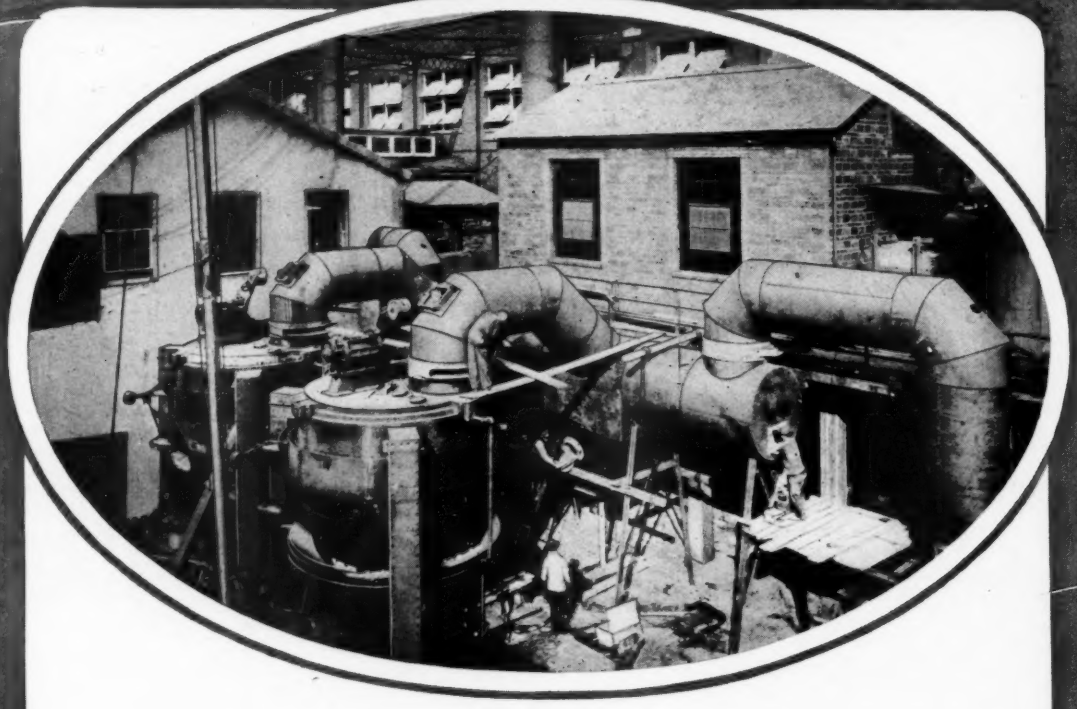

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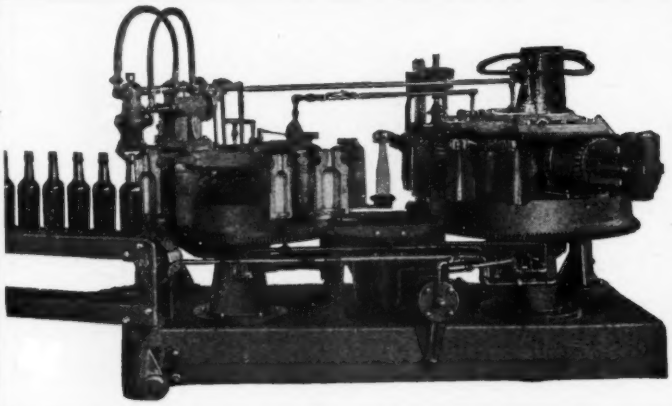

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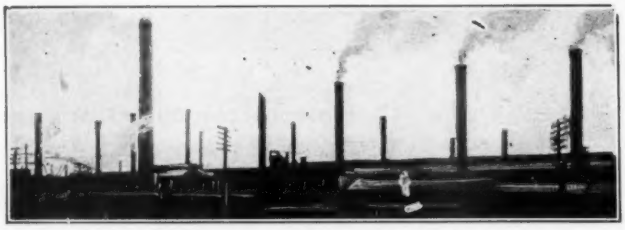

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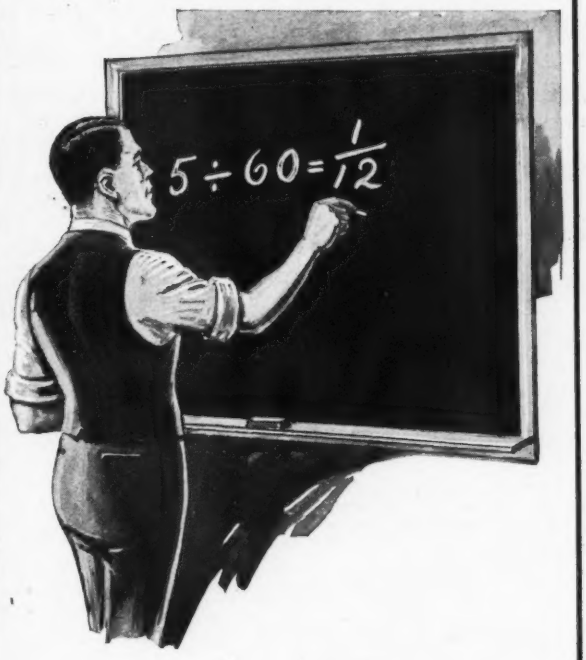

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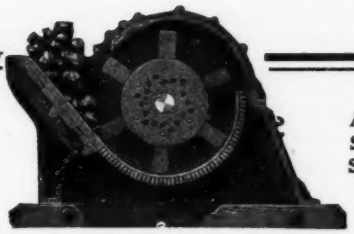

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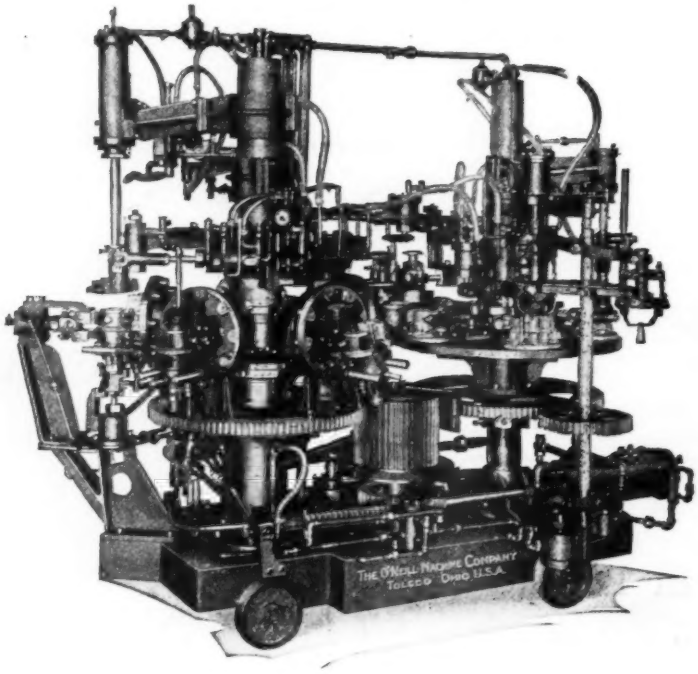

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Vol. 3 NEW YORK, JULY, 1922 No. 7

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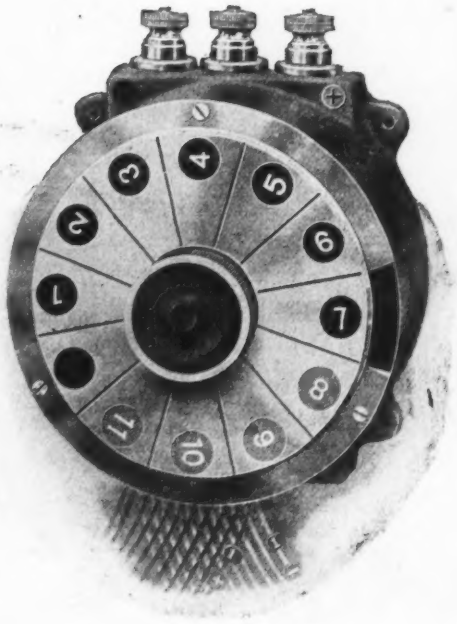

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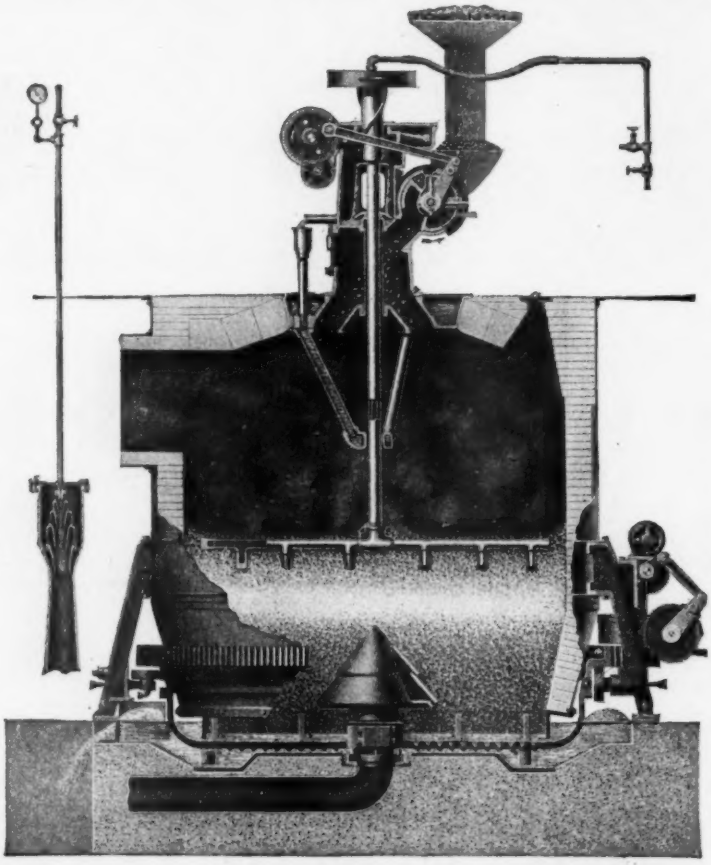

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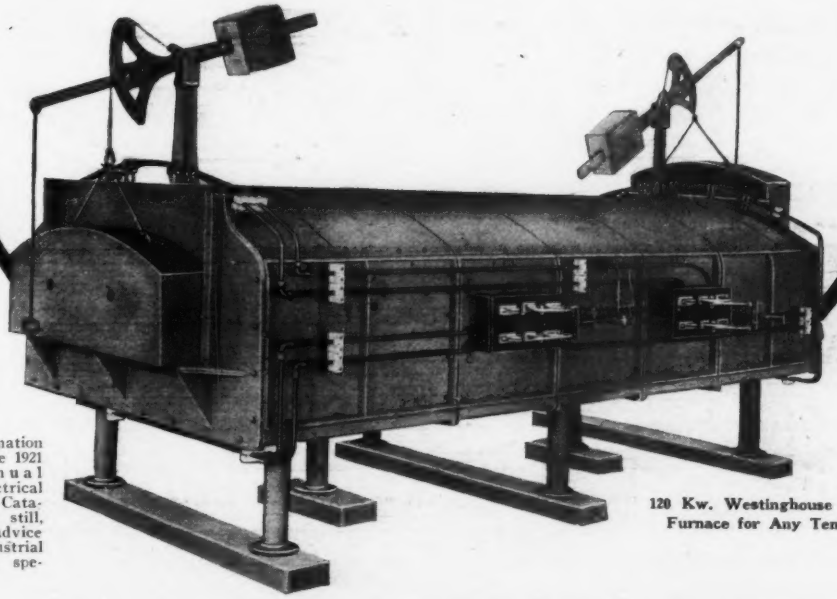

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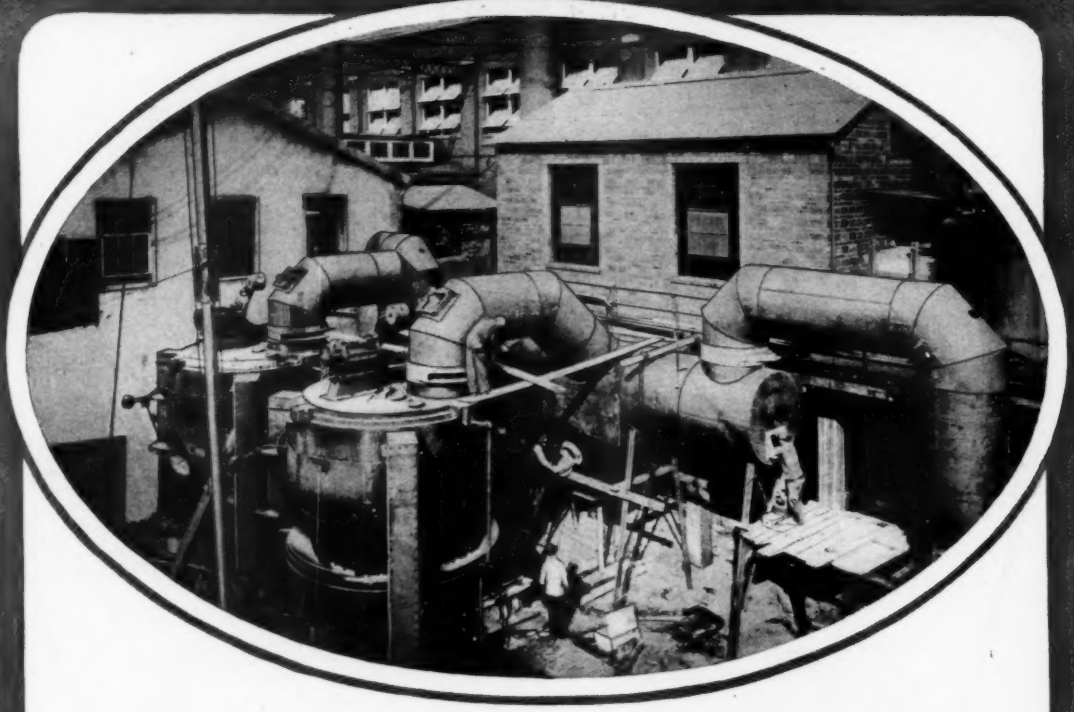

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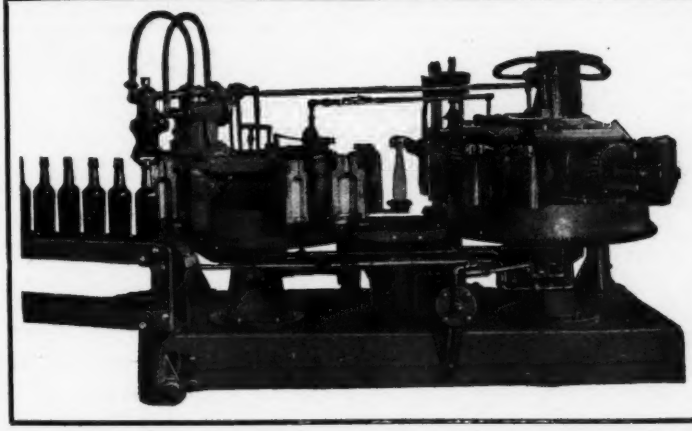

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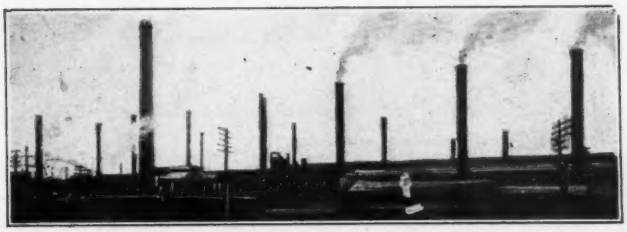

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(Continued on page 12)

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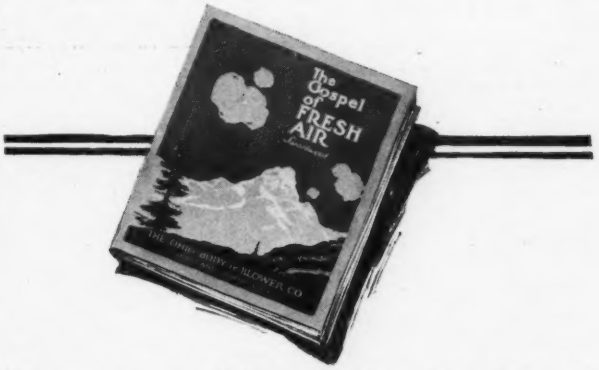

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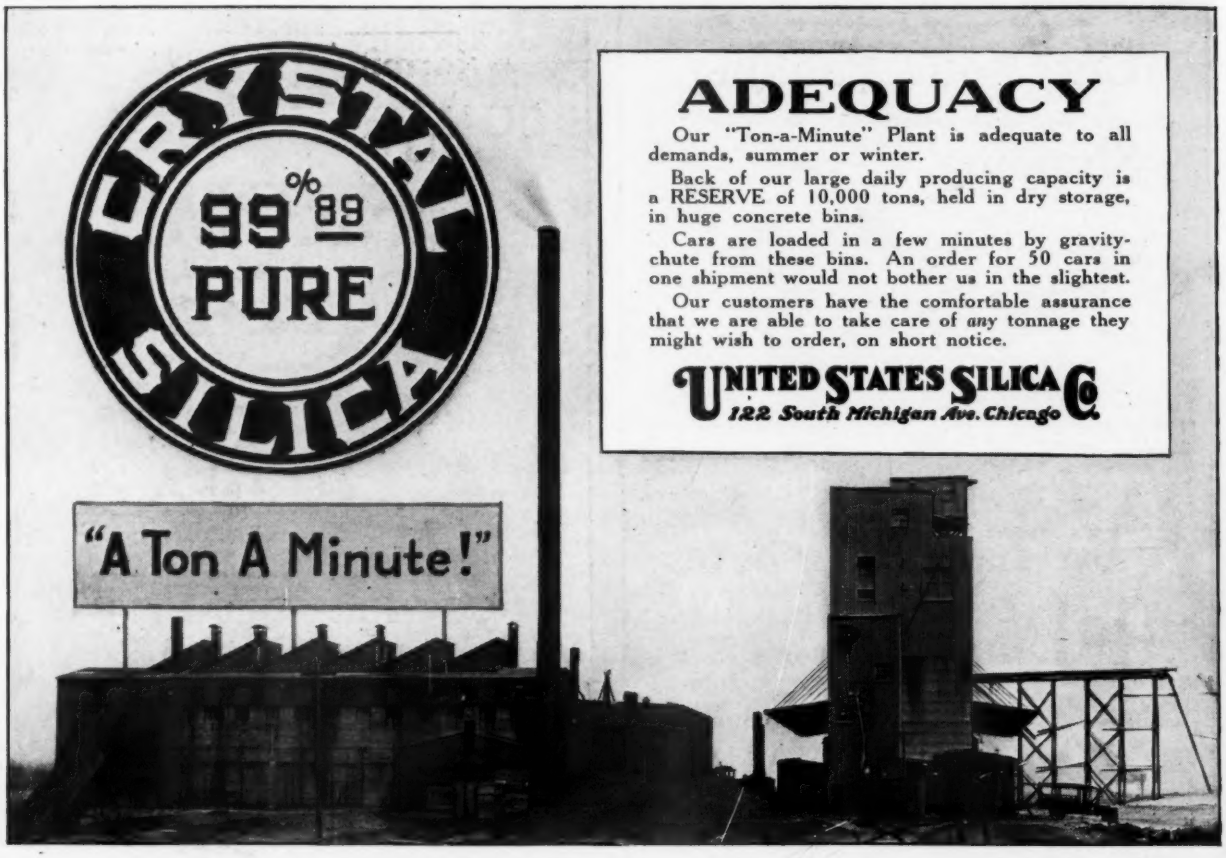

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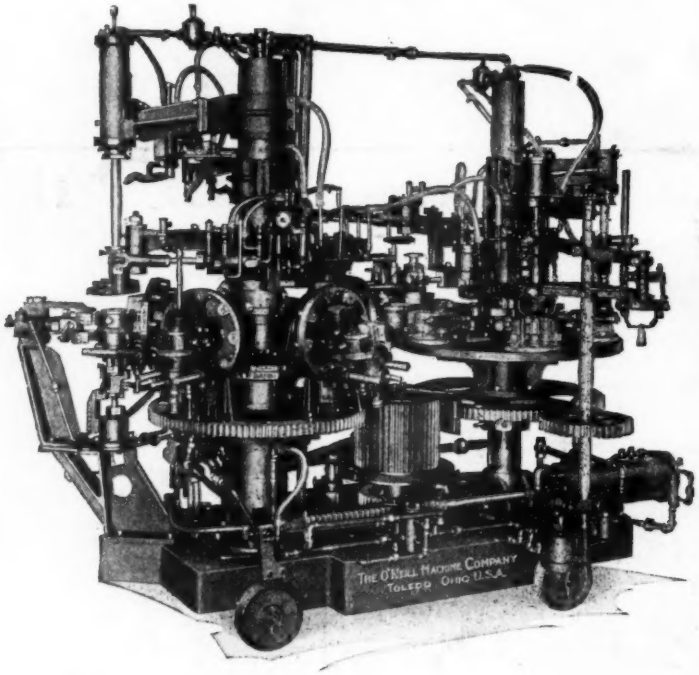

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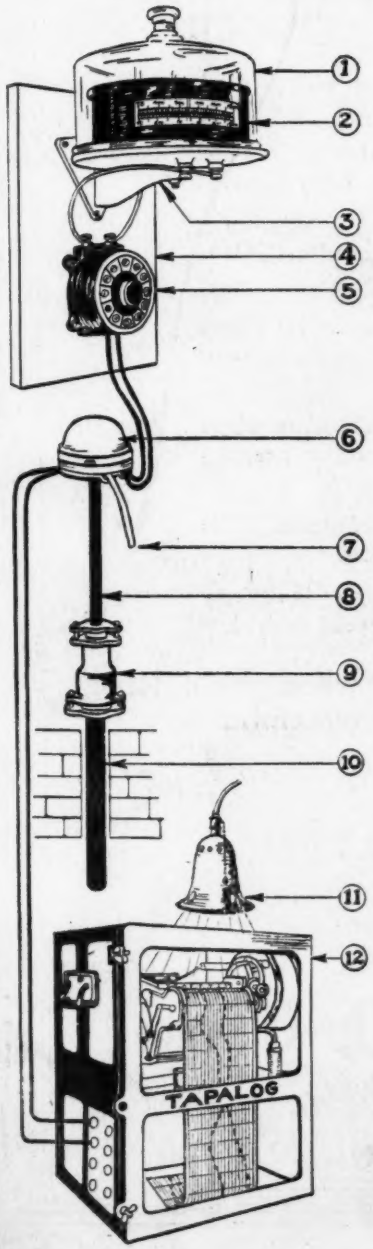

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When You Bought That Motor Car—

You remember the difficulty you had in making the selection because each different make of car had one or more points of distinct superiority.

After you have made a study of the Chapman Continuous Gas Producer, you will be impressed with the fact that so many superior features are combined in one machine.

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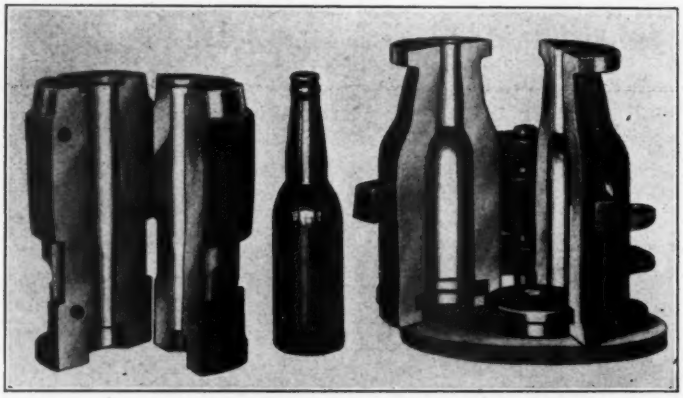

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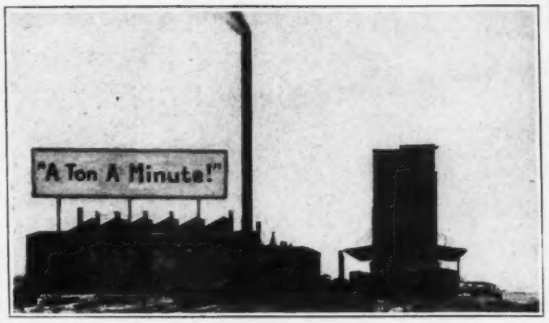

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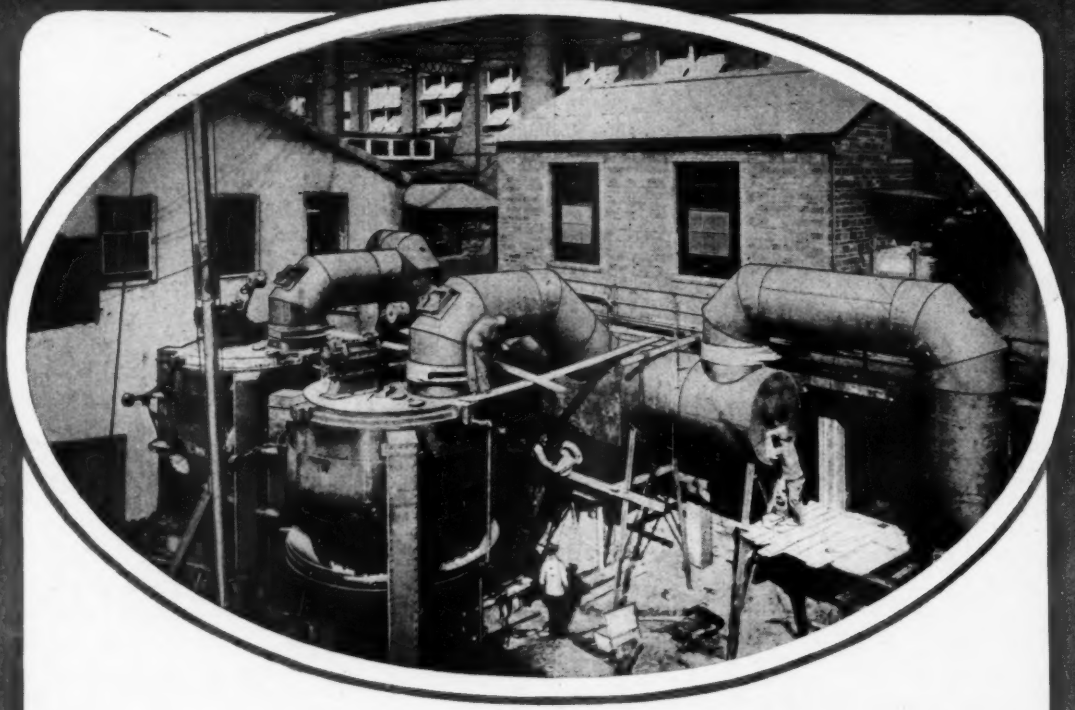

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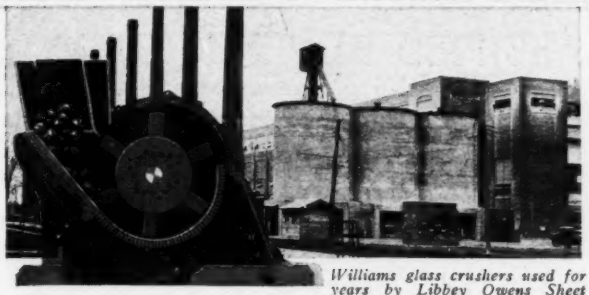

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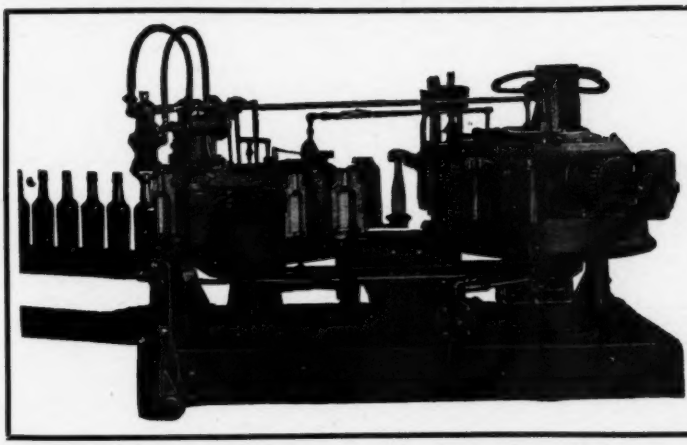

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(Continued on page 10)

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Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.
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Wiederholdt Construction Co., 625 Bank of Commerce Building, St. Louis, Mo.

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Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Willetts Company, The, Pittsburgh, Pa.

TANK FURNACES (See Furnaces)

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Johnston Brokerage Company, Pittsburgh, Pa.

ZINC OXIDE
Drakenfeld, B. F., & Co., Inc., New York.

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Because they have maintained high standards of business practice, many of the advertisers listed here have become leaders in their respective lines.

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THE GLASS INDUSTRY

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$2

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to better adventage than for a year's subscription to

THE GLASS INDUSTRY

50 Church St., New York

The Pittsburgh Line

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We will be glad to direct you to our nearest Show Room or mail you our Glassware Catalogue No. 21. Write today.

Pittsburgh Lamp Brass & Glass Co.
Dept. 30 PITTSBURGH, PA.

Johnston Brokerage Co.

Manufacturers

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Excellent Service—Best Quality—Large Capacity

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First Class Shipping Clerk—One familiar with bottles, handling of pool and bulk cars and capable of managing men. Splendid opportunity for the right party. State your age, whether married or single, and where last employed. Address—Shipping Clerk, care THE GLASS INDUSTRY, 50 Church St., New York.

WANTED

Miller Feeder Operators—Experienced feeder operators to install and also some to operate Miller feeders. None of our customers' employees need apply.

Miller Glass Engineering Co.
Swissvale, Pa.

Mr. Owens said:

"building up a business is only the beginning of the struggle. Your competitors are working to build theirs up too. Other men are inventing new methods. For purely business reasons you must keep on trying to stay in the lead. **If you sit still and drift, others will soon forge past you.**

These remarks were made to Keene Sumner during an interview with Mr. M. J. Owens, printed recently in *The American Magazine.*

Apply these wise words from the most conspicuously successful man in the industry to your own case. Push ahead! One golden opportunity for doing so, for building up enduring good-will towards your business and for educating the whole industry to a better appreciation of your products and services, is available to you through the intelligent and persistent use of the advertising pages of **The Glass Industry.**

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is becoming more and more the glass manufacturer's fuel.

The application of Producer Gas in Glass Melting cannot be dealt with in quite the simple and certainly not in the wasteful manner used in the past with natural gas.

Wisdom must be exercised in the choice of Producer Gas Equipment.

If you have in mind the question of installing Producers or of improving your present installation, we are in a position to help you.

A letter to us stating your problems will not commit you in any way and may assist you to better results in your melting operations.

STANDARD MANUFACTURING CO., ENGINEERS AND MANUFACTURERS **Corning, N.Y.**

Wiederholdt System of Tile-Concrete Construction

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FOR
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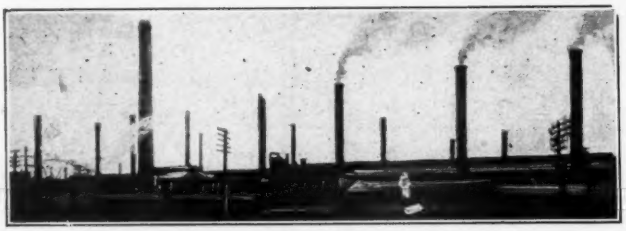
Write for booklet, "The Modern Chimney"



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FOR
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Send us your Specifications

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High In Potash
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PULVERIZERS OF

Maine Feldspar

The Best Spar Produced Anywhere

Samples and prices furnished upon request. Standard grades for all lines. Orders filled at short notice.

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PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

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KRYOLITH
The Standard Opacifier

Nature's unvarying combination of Fluorine, Soda and Alumina (with less than 2% Silica) has made GREENLAND KRYOLITH the ideal glass opacifier. For over 60 years it has shown its worth in the ware and on the cost sheet.

NATRONA HYDRATE OF ALUMINA, GLASSMAKERS SALT CAKE AND OTHER CHEMICALS FOR THE GLASS INDUSTRY.

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Dense
Soda Ash
For Glassmakers

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Announcement

We are pleased to announce that we have perfected a new

AUTOMATIC BLOWING MACHINE

FOR LARGE WARE

up to and including gallon packers.

We shall be glad to send you full particulars of this new machine upon request.

The O'Neill Machine Company

TOLEDO, OHIO, U. S. A.

LONDON PLANT: Albany Works, Trenmar Gardens
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SEP 8 1922

The Glass Industry

REG. U. S. PAT. OFF.

The First Technical Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials and Glass Factory Equipment and Operation

GLASS INDUSTRY PUBLISHING CO., INC.
50 CHURCH STREET, NEW YORK

PUBLISHED MONTHLY. $2.00 A YEAR
SINGLE COPY 20 CENTS

Vol. 3. NEW YORK, SEPTEMBER, 1922 No. 9

LIFE

SEVEN years have elapsed since the inception of the Tapalog's activity in the glass industry. This event was marked by the installation of two instruments at the Toledo Plant of The Owens Bottle Company. Those machines have been used continuously since the day they were installed, and will be serviceable for another ten years. After seven years of service, they can be compared favorably with any other type of Pyrometer Recorder of recent manufacture.

Tapalogs require normal care, but the replacement evil is eliminated.

Tapalogs, like fine watches, do not have to be new to be good, yet they are but slightly more expensive than other recorders.

WILSON-MAEULEN CO., INC.

385 CONCORD AVENUE, NEW YORK

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Charging Floor and Overhead Coal Bins in a Chapman Gas Producer Installation

Coal Prices Go Up!

Every time that coal prices go up one cent, there is added just one more good reason for installing Chapman Equipment.

Chapman Continuous Gas Producers save fuel. Therefore, the higher the cost of the fuel, the more money saved by the users of this equipment. Glass Plant managers know that an increase of a few cents in the price of coal per ton means hundreds and sometimes thousands of dollars each year to the Glass Factories.

A Chapman representative will be glad to call and tell the story of how Chapman Floating Agitator Producers have saved their purchase price in less than a year. How much more will they do with the ever increasing price of fuel?

The
CHAPMAN ENGINEERING CO.
C&G *Division of The*
COOPER
MT. VERNON, OHIO, U. S. A. CO.
50 Church St., New York Oliver Bldg., Pittsburgh

Since 1833 Engineers and Builders

THE GLASS INDUSTRY, Vol. 3, No. 9, September, 1922. Published Monthly by Glass Industry Publishing Company, Inc., 50 Church St., New York, $2.00 a year. Single copy, 20 cents. Entered as second-class matter August 10, 1921, at the Post Office at New York, N. Y., under the act of March 3, 1879.

DIXON MUFFLE LEHRS

Ten features of the new *Dixon Muffle Lehr* you cannot afford to overlook in remodeling your present lehrs or installing new annealing equipment:

1—Insures absolute temperature control throughout entire length of lehr.
2—Operates perfectly with any kind of fuel.
3—Made for any width up to twenty feet.
4—Exceedingly low power and low fuel consumption.
5—Noiseless in operation.
6—Prevents pan checking.
7—No smoke, dirt, tar or soot—always clean.
8—All parts easy of access for inspection and repairs.
9—Employs interlocking tile construction—making tile replacement simple during operation and without shutting down.
10—Substantial in construction—correctly designed—preferred by intelligent workmen.

NOTE—"Dixon Special" Composition Muffle Tile is standard equipment in all lehrs.

H. L. DIXON COMPANY

"EVERYTHING FOR THE GLASSHOUSE."

P. O. Box 140, Pittsburgh, Pa.

Office and Works, Carnegie, Penna.

Let our engineering department send complete data on all of the above Dixon features.

MORE GLASS—LESS FUEL!

HIGH DUTY TANK

A USER OF OUR TYPE TANK REPLIED IN PART TO ANOTHER GLASS MANUFACTURER'S REQUEST FOR INFORMATION AS FOLLOWS:

"We are perfectly satisfied that this tank is far ahead of any tank we ever had in our factory before. Although the tank is small, we are able to operate four machines full capacity and before we were never able to operate more than three machines. We are also satisfied that we have reduced our fuel expense at least one-third."

FURTHER PROOF OF THE SUCCESS OF THE HIGH DUTY TANK IS INDICATED BY THE NUMBER OF REPEAT ORDERS WE HAVE RECEIVED, ONE CONCERN HAVING ORDERED THEIR THIRD.

THE AMSLER-MORTON COMPANY

FULTON BUILDING PITTSBURGH, PA.

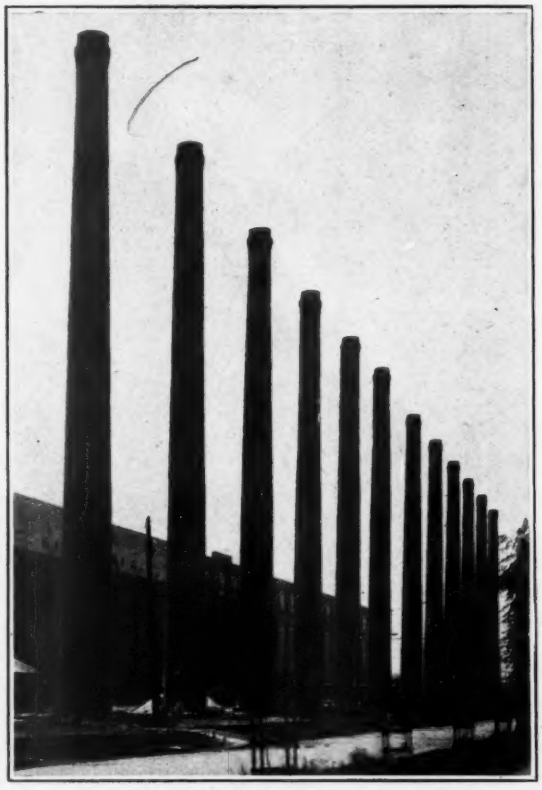
Wiederholdt System
Chimneys and Batch Bins

Built of a combination of Three Strongest Materials —

Hard Burned Tile
Portland Cement Concrete
High Carbon Steel

The first chimney we built sixteen years ago is still in use and in perfect condition.

Send Us Your Plans and Specifications



12 Chimneys at Libbey-Owens Sheet Glass Co., Charleston, W. Va.

10 Batch Bins at Illinois Glass Co., Alton, Ill.

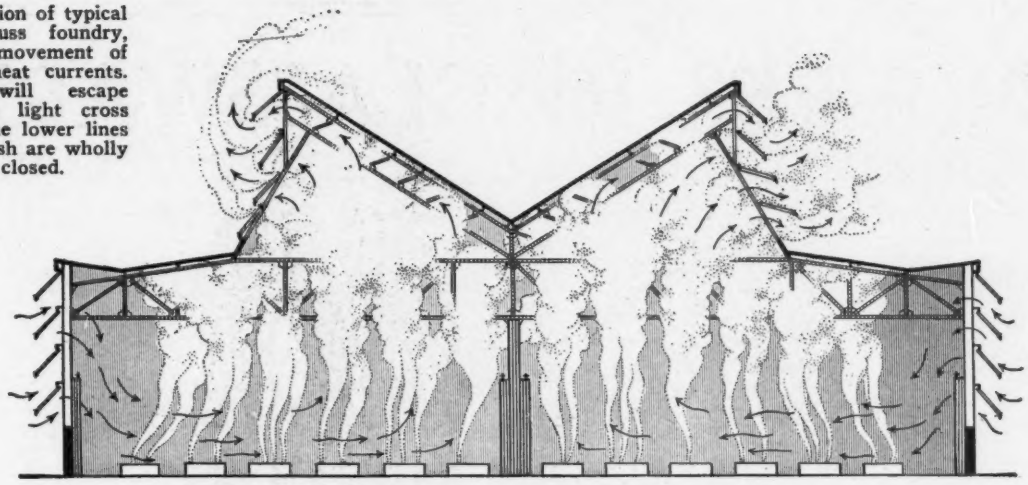
Our New Booklet
"THE MODERN CHIMNEY"
is just off the press—
a card will start it
to you.

Wiederholdt Construction Co.

NEW YORK
504-E, 30 Church Street

ST. LOUIS
625 Bank of Commerce Bldg.

Cross section of typical Pond Truss foundry, showing movement of air and heat currents. Smoke will escape against a light cross wind if the lower lines of roof sash are wholly or partly closed.



For All Heat-Producing Buildings—

Pond Truss

PATENTED

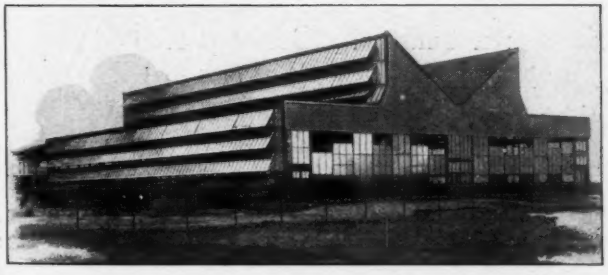
THE ROOF THAT VENTILATES

It discharges heat and smoke far more rapidly than any other type of roof.

It prevents cross currents and down drafts.

It has no pockets by which vitiated air might be cooled and recirculated.

The larger the building, the more striking is the ventilating efficiency of the Pond Truss.



A typical Pond Truss building, 115x195 feet, used as a brass foundry. Contains 32 melting furnaces, yet is comfortably cool in all weathers.

Used in the new Shreveport factory of the U. S. Sheet and Window Glass Co.; also by the Owens Bottle Machine Co., Toledo, the Toledo Glass Co., Toledo, the General Electric Co. Lamp Works, St. Louis, and about 200 forge shops, foundries, and other heat-producing plants in the United States and Canada.

The Pond Truss design is patented. We license its use to users of Pond Continuous Sash and other Lupton Steel Sash Products.

Catalogues 11 and 110 describe our industrial types of sash. Each type represents the highest standard of its kind.

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Mould Equipment for No. 25 O'NEILL NO BOY MACHINE

THE TOLEDO MOULD CO.

Manufacturers of

FINE MOULDS FOR GLASSWARE FOR ALL TYPES OF MACHINES

Toledo, Ohio, U. S. A. Cable Address: "Tomoco"

Standard Equipment

Nothing exists in this world without a reason. Consequently when plant after plant in the glass industry uses certain equipment you may be sure that it is not the result of chance.

ENGELHARD PYROMETERS

have been standardized on in many glass houses. They find that they get the accurate continuous service so necessary and that the maintenance even on thermocouples is nominal.

You, too, will find that

Engelhard Pyrometers Are Good Pyrometers To Standardize On

CHARLES ENGELHARD Inc.

30 Church Street (*Cat. G-2*) New York City

The Safest, Most Economical Shipping Boxes You Can Buy

THERE isn't a safer shipping box on the market than an H & D! These boxes are built with a specific purpose in mind—*to protect the goods they carry*—and you'll find them doing it for big and little shippers all over the country.

They are low-cost, lightweight and easy to pack and seal. They come to you folded flat for storage, yet ready for instant assembly. They will save you money on your box costs, freight costs and breakage costs, reducing them all to an absolute minimum.

Send us a typical shipment of your goods, charges collect, and we will make up a box for it with whatever interior packing is necessary, and send it to you for inspection. Quotations will be sent with the box so that you will have both the facts and our figures before you. This is an absolutely free service that entails no obligation. Write us today and ask also for our free forty-page book, "How to Pack It." It is crowded with box and packing facts that you will be glad to have.

The Hinde & Dauch Paper Co.
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Toronto, King St. Subway and Hanna Ave.

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first of a series

The movable element

Watch making has no problem like this. This assembly requires 13 parts and 43 operations. It weighs the same when finished as the common pin—35 to the ounce.

Three layers of 50 turns (150 turns) of .003" copper wire are heavily cemented together and baked and the form removed. To both ends are cemented diminutive aluminum brackets that form an anchorage for the ground steel pivots and the hair springs. The springs, pivots and the hollow aluminum pointer are then attached.

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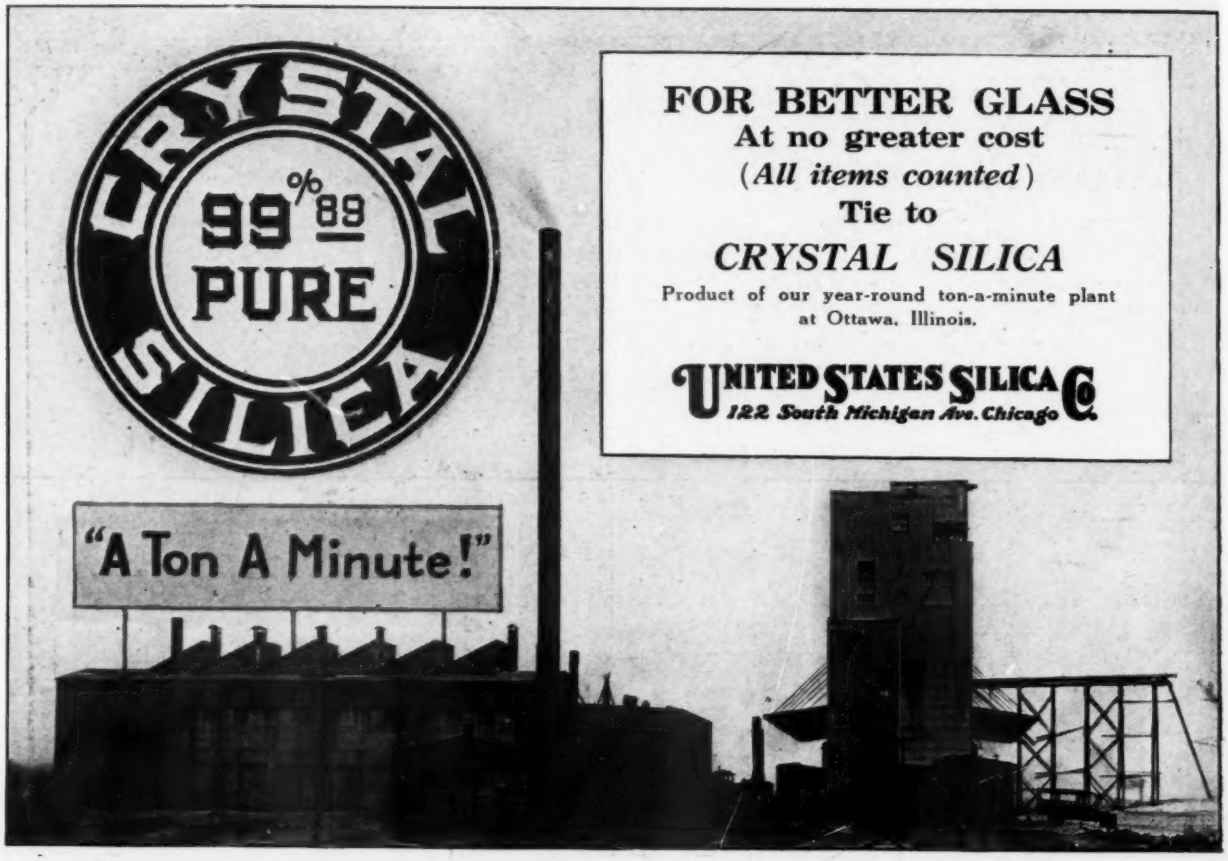
BROWN PYROMETERS
Most used in the world



FOR BETTER GLASS
At no greater cost
(All items counted)
Tie to
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Product of our year-round ton-a-minute plant at Ottawa, Illinois.

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WE HAVE A BARREL FOR YOU

Frink Decolorizer and Frink Anti-Color

for

LIME AND LEAD FLINT DRY PLATE
PLATE AND BOTTLE GLASS
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Prices Quoted on Application

Give It a Trial

Gives constant color in tank or pot.
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Read what Mr. Bastin says about HYTEMPITE

"We have found Hytempite specially well adapted to many glass factory purposes, especially to the necks of generators or furnace ports, where the heat is intense and where ordinary fire clay will not endure. We are using it wherever we have any repair work of that class to do."

(*Signed*) *Frank Bastin*

HYTEMPITE

Reg. U. S. Pat. Off.

(High Temperature Cement)

is a refractory plastic material, scientifically compounded for bonding fire brick and for kindred uses.

It forms a lasting union between materials joined, and retains its strength up to temperatures at which the best quality of fire brick will soften or fail.

The strong thin Hytempite joint does not depend upon heat for its adhesive qualities. It bonds at normal temperatures (air sets). It has approximately the same coefficient of expansion as the materials joined. Heat increases the strength of the bond.

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United States Refractories Corporation

MOUNT UNION, PA.

Pittsburgh Office: 1447 Oliver Building

PHONE GRANT 4889

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Silica Brick :: Silica Cement
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Our Brands, "MTU" Silica Brick and "USRCO" Fire Brick, Designed for Glass Tanks, By-Product Coke Ovens, Gas Retorts, Open Hearth and Metal Refining Furnaces, and Lime Kilns.

Capacity 70,000,000 per annum

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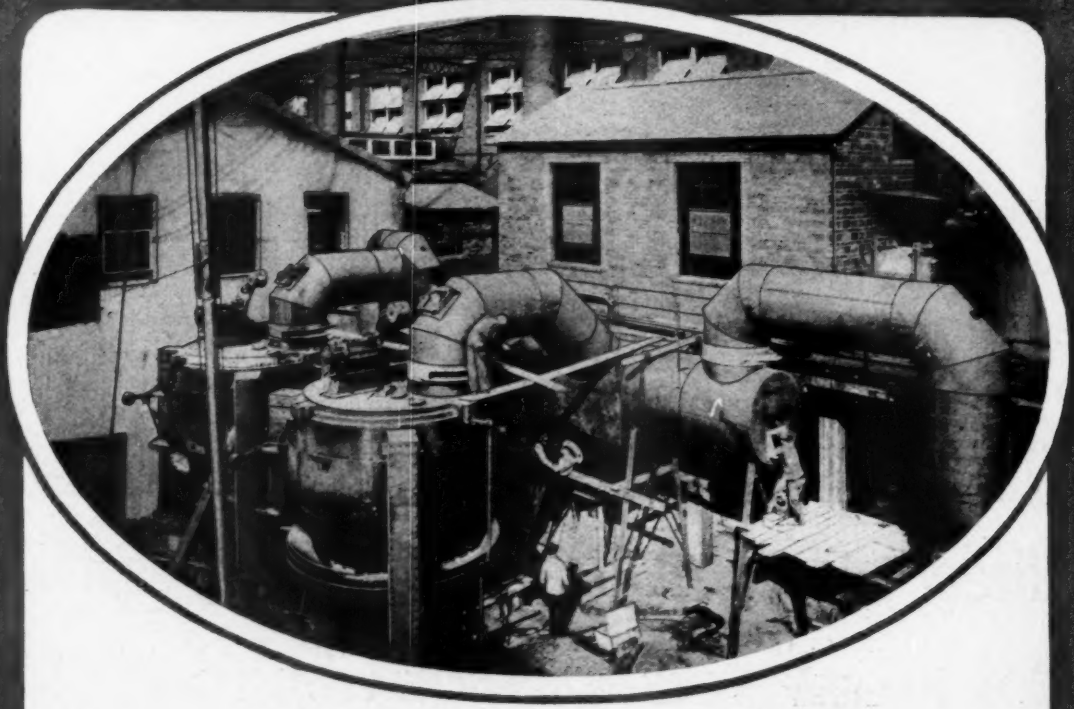
PRODUCER GAS MACHINES

COMPLETELY AUTOMATIC



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in course of erection.

A small installation at one of the leading
Glass Plants in Ohio.

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Pittsburgh Office: 610 Magee Building

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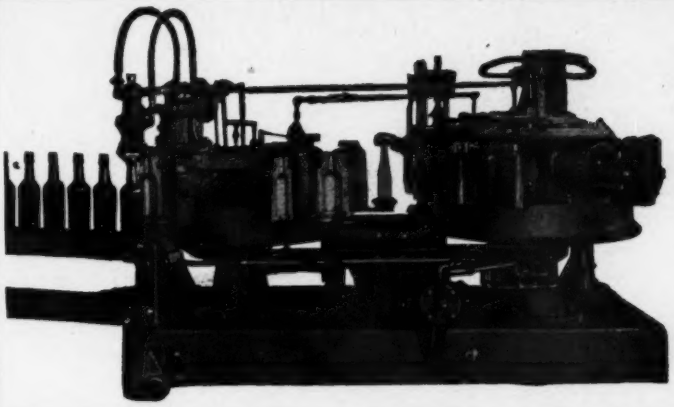

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Narrow Neck and Wide Mouth

Bottle Blowing Machines

Strictly Automatic When Operated With Mechanical Feeding Device

Can be Operated by Hand Gatherers

Speed 10 to 32 Bottles per minute, ranging in size from ½ oz. to Half-Gallon.

Lynch Glass Machinery Co.

Anderson, Ind. **U. S. A.**

Cable Address: "LYNCHNOBOY" Anderson.

Codes: A. B. C. Fifth Edition, Bentley's, Western Union

Automatic Glass House Machinery

for the manufacture of

Tumblers	Auto Lenses	Lemon Reamers	Fruit Jars	Percolator Tops
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705-719 ANN STREET, **(Office and Factory)** **COLUMBUS, OHIO, U. S. A.**

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McCamic - Batchell - Bergman Co.

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TOLEDO, OHIO

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! ! ! We have the experience, originality in design, our compensation for services rendered is always right and we give our work personal supervision. ! ! !

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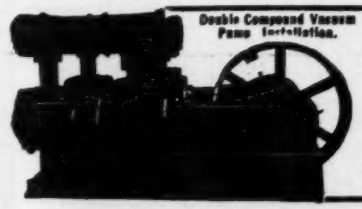

AIR COMPRESSORS and VACUUM PUMPS

Installations at
Hazel-Atlas Glass Co.
Macbeth Evans Glass Co.
Maryland Glass Corp.
Federal Glass Co.
Owens Bottle Co.
American Bottle Co.

BURY COMPRESSOR CO.
ERIE, PA.

An Achievement

Do You Know—

That Within a Short Span of Years

We have made installations of our Lehr Loaders and Conveyors in fifty-five (55) glass factories, in nine (9) countries of the world.

AND

In the majority of cases, repeat orders have been received, not just one, but two, three, or four.

"AUTOMATIC" LEHR LOADERS AND CONVEYORS

ASSURE

150 to 300% reduction in labor payroll
25% reduction in fuel costs
Increased production **Uniform product**

Automatic delivery of ware from blowing machine to and into Lehr.

Better make such an installation TODAY and conserve TOMORROW'S payroll. WHY NOT?

Automatic Machinery Company

Terre Haute, Indiana **U. S. A.**

P. S. List of installations and complete information furnished upon request.

4075-L-17

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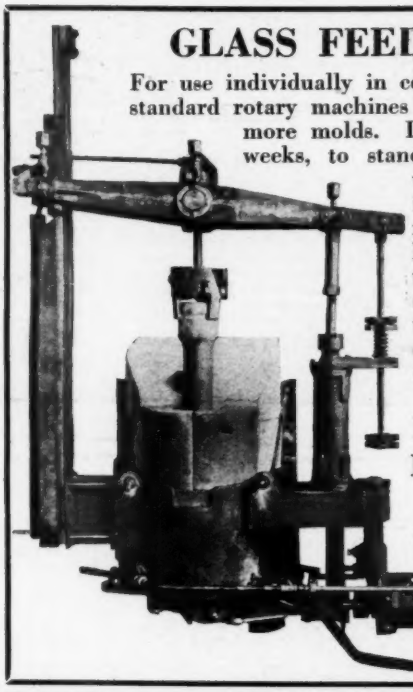
The Pittsburgh Line of illuminating glassware, lamps and lighting units is ours exclusively. It includes the famous "Delica White" and "Utopia" grades—famous for years as two of the most popular lines of illuminating glassware manufactured anywhere.

We will be glad to direct you to our nearest Show Room or mail you our Glassware Catalogue No. 21. Write today.

Pittsburgh Lamp Brass & Glass Co.
Dept. 30 PITTSBURGH, PA.

GLASS FEEDERS



For use individually in conjunction with standard rotary machines mounting 4 or more molds. Installed in two weeks, to standard ring hole without blocking fire. Being rapidly adopted by leading manufacturers. Installed on royalty basis or sold outright. Liberal terms.

Miller Glass Engineering Company
SWISSVALE, PA.

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265 Green Street, Brooklyn, N. Y.

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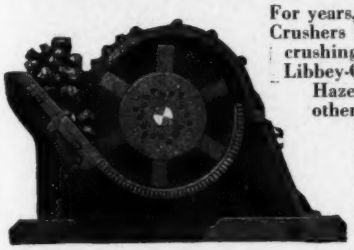

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66

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GLASS INDUSTRY PUBLISHING CO., INC.
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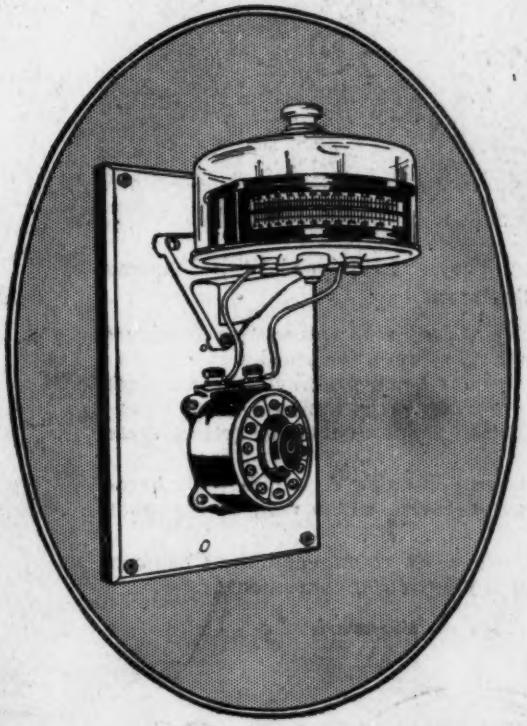

We Quote.

The last paragraph of a long letter we received from the Superintendent of a midwest glass plant is this:—

"I also want to commend your company for the kind of service that you have given us. As any one knows who has had experience with an instrument of this kind, the company back of the instrument is just as important as the quality of the instrument, and it has been a pleasure to deal with your company, due to the promptness and effectiveness of your service department, and the unfailing courtesy of your people."

It has been our endeavor, before and since we received that letter, to deserve his and your confidence.

We will send copy of the whole letter if you wish it. Or we will send one of those competent, courteous representatives to your plant.

WILSON-MAEULEN CO., INC.

385 CONCORD AVENUE, NEW YORK

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THE LABOR PROBLEM IS SETTLED FOR THE GAS HOUSE

One Man Operates Four Producers After They Are Equipped With Chapman Floating Agitators.

A glass plant engineer who recently visited a Chapman Gas Producer installation reported favorably to his executives upon the sturdiness and simplicity of the machine, the high quality of gas being produced, the excellent condition of the fire bed and the low carbon content of the ash. Then he added, "And one ordinary laborer was operating the producers and getting these results."

We have made installations of Chapman Floating Agitators with Automatic Coal Feed on existing hand-poked producers which reduced the labor on the charging floor as much as 80%.

Where the required capacity warrants it we recommend the **Chapman Completely Mechanical Producer** with every operation continuous.

We move the parts that do the work

The
CHAPMAN ENGINEERING CO.
C&G *Division of The*
COOPER CO.

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50 Church St., New York Oliver Bldg., Pittsburgh

Since 1833 Engineers and Builders

THE GLASS INDUSTRY, Vol. 3, No. 10, October, 1922. Published Monthly by Glass Industry Publishing Company, Inc., 50 Church St., New York, $2.00 a year. Single copy, 20 cents. Entered as second-class matter August 10, 1921, at the Post Office at New York, N. Y., under the act of March 3, 1879.

"Everything For The Glasshouse"

DIXON MUFFLE-LEHRS

Just a few of the many discriminating glass manufacturers using the new DIXON Standard Muffle Type Lehr:

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Charles Boldt Glass Company, Huntington, W. Va.
Whitall-Tatum Company, Millville, N. J.
Capstan Glass Company, Connellsville, Pa.
Atlantic Bottle Company, Tarentum, Pa.
Ball Bros. Glass Mfg. Co., Muncie, Ind.
Schram Glass Mfg. Company, Hillsboro, Ill.

There are reasons, let us tell you what they are.

H. L. DIXON COMPANY

P. O. Box 140, Pittsburgh, Pa.
Office and Works: Carnegie, Penna.

Amco Type Continuous Muffle Lehrs

THIRTY-SIX HAVE BEEN PURCHASED BY PROGRESSIVE MANUFACTURERS THIS YEAR

DURABLE and substantial construction combined with low fuel consumption and perfect annealing are a few of the foremost features.

IF your lehrs do not embody these absolutely essential points your annealing apparatus is a source of unnecessary expense and loss that we can prevent.

MAY WE CO-OPERATE WITH YOU TO IMPROVE YOUR ANNEALING AND REDUCING COSTS?

THE AMSLER-MORTON COMPANY

FULTON BUILDING **PITTSBURGH, PA.**

A Test Run On Goblets

in a

Westinghouse HEVI-DUTY Electric Furnace

TRADE MARK

REG. U. S. PAT. OFF.

A West Virginia Glass Company made a test run of several thousand goblets in a 22-in. wide, 5 ft. high, 10 ft. long Westinghouse Hevi-Duty Electric Furnace.

The goblets were passed through the furnace in metal containers consisting of nine trays, each holding 25 goblets; the trays being arranged in three layers.

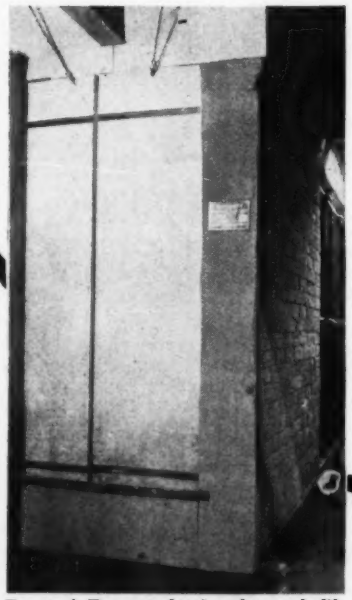
At the end of the test run 65 goblets were taken at random from the top, center and bottom layers.

When tested in a spectroscope 64 goblets showed absolutely no refraction of light rays, and were passed as A-1. One goblet had almost imperceptible refraction of light rays and was, therefore, rated as B-1. The company's physicist stated that, compared with their general run of product, this one goblet would ordinarily have been rated as A-1.

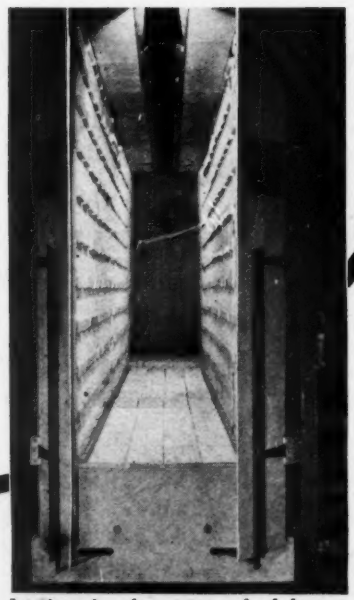
In their natural-gas fired annealing lehrs the company gets very few A-1 grades, the majority being B-1, and a quantity C-1, the lowest permissible grade.

Westinghouse Electric & Manufacturing Co.

East Pittsburgh, Pa.



Front of Furnace showing doors of different width, so that one door closes ahead of the other.

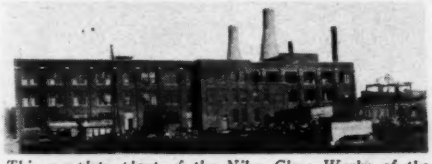


Interior view from rear end of furnace. The suspension rods of the containers pass through the channel way at top of furnace.

Westinghouse

Manufacture de Glaces de Maubeuge, Kousies, Nord, France (Pilkington Bros., Ltd.). This complete plant, located in the French devastated area, was completely rebuilt by The Austin Company.

Complete plant for the manufacture of Plate and Window Glass, built for Pilkington Bros., Ltd., at Thorold, Ont., by The Austin Company.



This complete plant of the Niles Glass Works of the National Lamp Works at Niles, Ohio, was designed, built and equipped by The Austin Company.

A building recently completed for the Corning Glass Works, Corning, N. Y., by The Austin Company.

Partial List of Austin Clients in the Glass Industry

American Plate Glass, Kane, Pa.; Corning Glass Works, Corning, N. Y.; Dominion Glass Co., Redcliffe, Alberta, Can.; H. C. Fry Glass Co., Rochester, Pa.; Gill Glass Co., Philadelphia; Indiana Glass Works, Dunkirk, Ind.; International Glass Co., Millville, N. J.; Manufacture de Glaces de Maubeuge, Maubeuge, France; National Lamp Works of the General Electric Co.: Euclid Glass Division, Cleveland, Ohio; Louden Glass Division, Fostoria, Ohio; Niles Glass Division, Niles, Ohio; Rhode Island Glass Works, Valley Falls, R. I.; Pilkington Brothers, Ltd., Thorold, Ontario, Can.; Travis Glass Co., Clarksburg, W. Va.

Austin Builds for the Glass Industry

The Austin Company has not only built for many manufacturers in the Glass Industry but has executed repeat contracts for a number of its clients. For Pilkington Bros., Ltd., Austin has built a complete plant with extensive housing facilities at Thorold, Ont., and for this large international concern, Austin also rebuilt a mammoth glass plant at Maubeuge, France, which was destroyed during the great war.

For the National Lamp Works of the General Electric Company, Austin has built glass plants and warehouses at many locations from coast to coast.

Austin has also built additions and buildings of various sizes for other well known manufacturers in the Glass Industry.

Austin engineers are prepared to design, build and equip complete glass plants, plant extensions and modifications with speed and economy. Consultation involves no obligation. Phone, wire or use the coupon.

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Engineers and Builders of Modern Glass Plants

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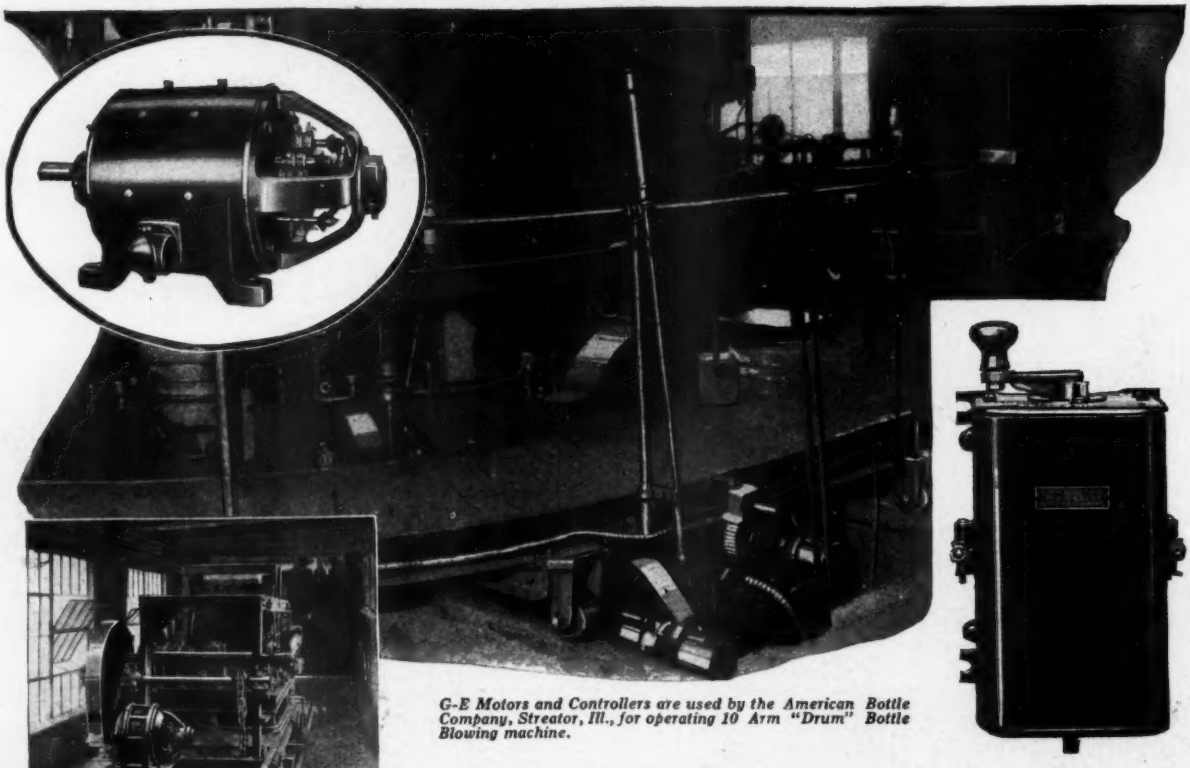
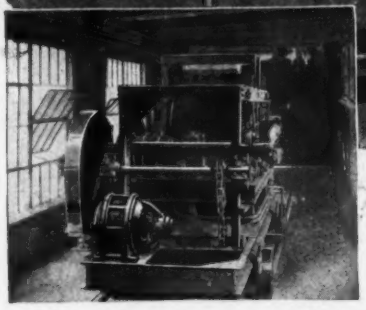
By the proper electrification of his machines, the glass manufacturer obtains the most improved methods of plant operation



G-E Motors and Controllers are used by the American Bottle Company, Streator, Ill., for operating 10 Arm "Drum" Bottle Blowing machine.



G-E Motors driving Mixing Car, Libbey Owens Sheet Glass Co., Charleston, W. Va.

G-E Motors provide for simple and accurate control of speeds in operating conveyor-type lehrs.

How G-E Motors Improve Your Plant

With G-E Motors throughout your plant—there are certainty, smoothness, and sustained speed in all operations; which mean immediate dollars saved, less wastage, and better and greater production for every hour's run.

Specialists of the General Electric Company are experienced in the requirements of the glass industry—and will gladly cooperate with you in installing the proper G-E Motors and Controllers for the improved operation of your plant equipment.

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What's "Under the Hood" of Brown Pyrometers

(2nd of a series)

23 Special Machine Tools to make this Diminutive Bracket

and each cuts to an accuracy of 1/1000"

TO pick it up you'd think it was perhaps made by a master die maker for some very important experimental apparatus. To fit it down over the guide pins that holds it in place, you'd be sure it was.

It is a very fine example of brass die casting, and one of the most difficult ever made. Almost every one of its intricate surfaces and nearly all the holes must be machined to an accuracy of 1/1000", for it carries a movable element as sensitive as "the breath of life" itself. It must keep that element *exactly* centred between the powerful magnet pole-pieces and the soft iron core which are both ground to 1/1000" accuracy.

It is a fair sample of Brown methods all the way through—methods that have produced a pyrometer so advanced, electrically, and so superior in accuracy and durability that there are as many of them in use in America as all other makes combined.

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have been standardized on in many glass houses. They find that they get the accurate continuous service so necessary and that the maintenance even on thermocouples is nominal.

You, too, will find that

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Because it is **uniformly** pure and free from Iron.
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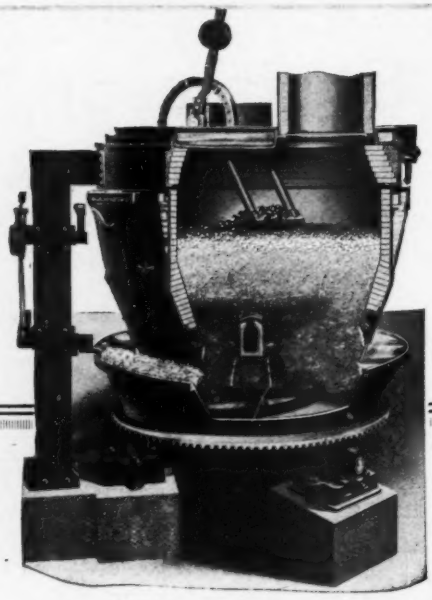

RELIABILITY is that supreme quality which out-values all others where continuous operation is imperative without delay or breakdown.

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For Ten Years

The Morgan Pokerless Producer-Gas Machine

has been making firm friends wherever installed, principally by reason of its absolute reliability. It is the one exception to the general experience with Gas Producers in this respect.

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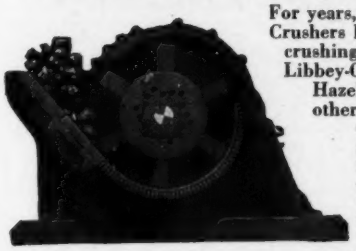
Williams Glass Crushers



For years, Williams Hinged Hammer Crushers have been the standard for crushing glass in such plants as Libbey-Owens Sheet Glass Co., Hazel-Atlas Glass Co., and many others.

They reduce to 1", ½" or any fineness you wish without preliminary crushing. Size of crushed material also percentage of fine goods can be regulated to suit operator's wishes.

Write for details on a size for your use.

Williams Patent Crusher & Pulverizer Co.

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For Better Production

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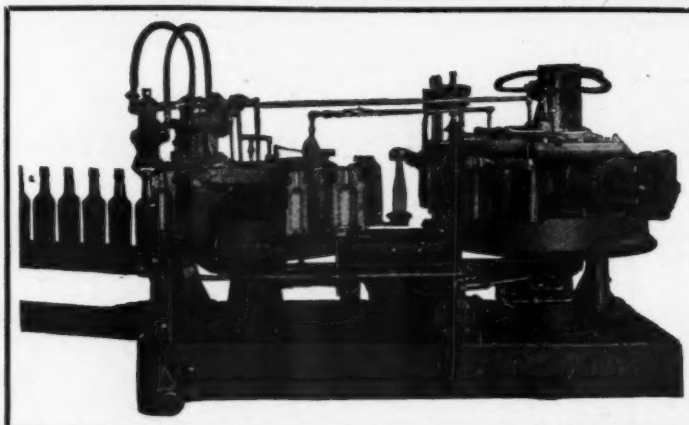

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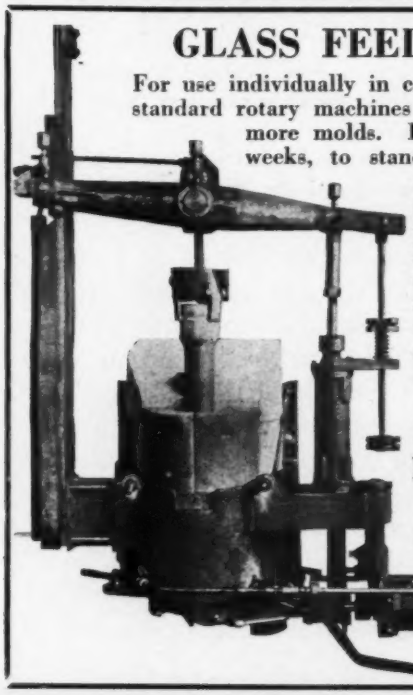

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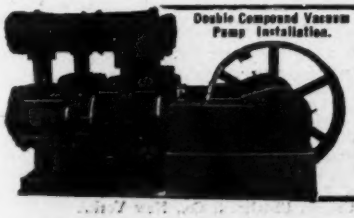

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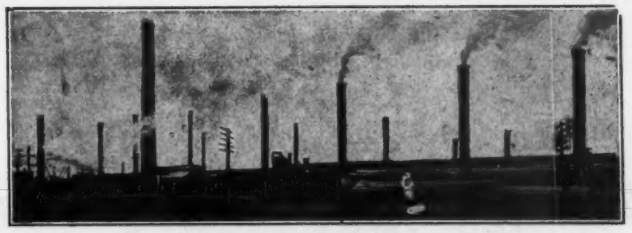

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NOV 6 1922

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The First Technical Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials and Glass Factory Equipment and Operation

GLASS INDUSTRY PUBLISHING CO., INC.
50 CHURCH STREET, NEW YORK

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SINGLE COPY 20 CENTS

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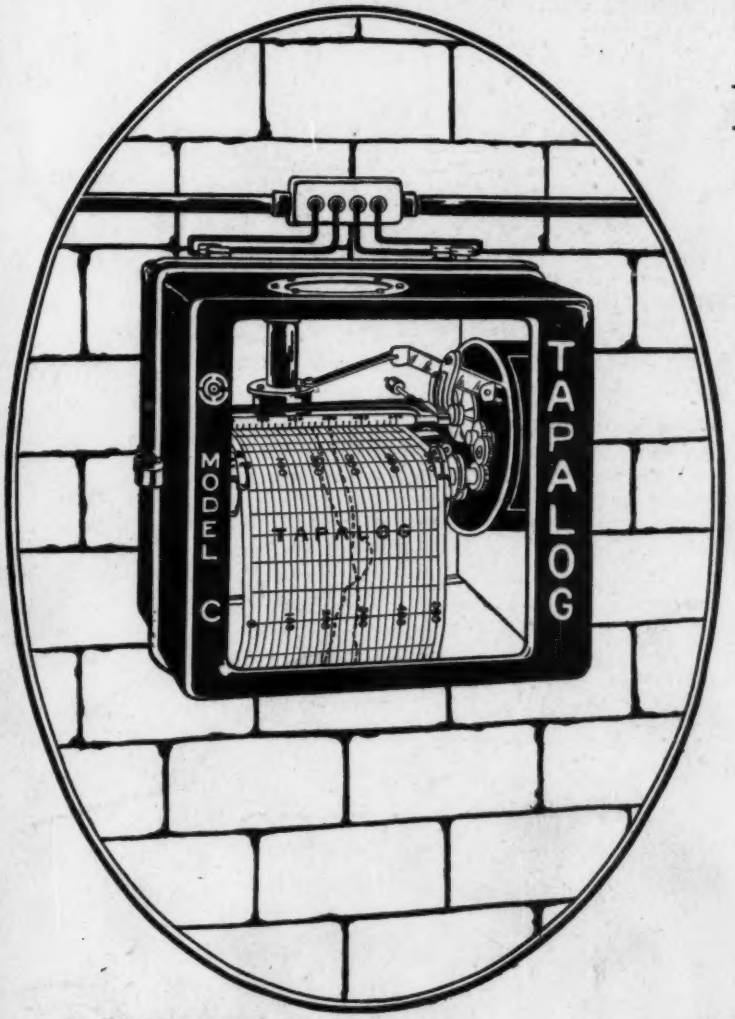

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On October 2, 1922 five double record Model C TAPALOGS, exactly like those destroyed in the fire, were ordered by the Berney Bond Glass Co.

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A glass plant engineer who recently visited a Chapman Gas Producer installation reported favorably to his executives upon the sturdiness and simplicity of the machine, the high quality of gas being produced, the excellent condition of the fire bed and the low carbon content of the ash. Then he added, "And one ordinary laborer was operating the producers and getting these results."

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THE GLASS INDUSTRY, Vol. 3, No. 11, November, 1922. Published Monthly by Glass Industry Publishing Company, Inc., 50 Church St., New York, U.S.A. $2.00 a year. Single copy, 20 cents. Entered as second-class matter August 10, 1921, at the Post Office at New York, N. Y., under the act of March 8, 1879.

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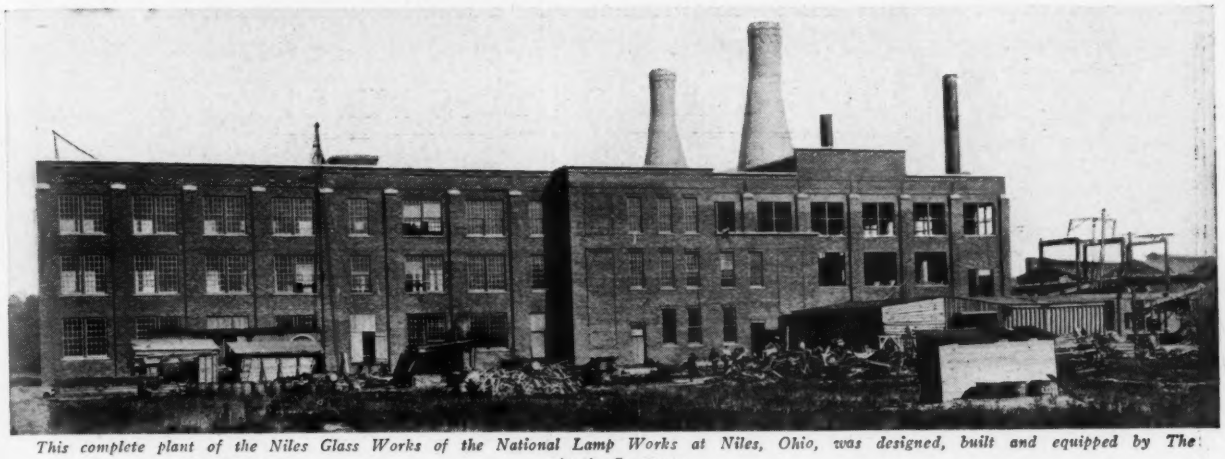

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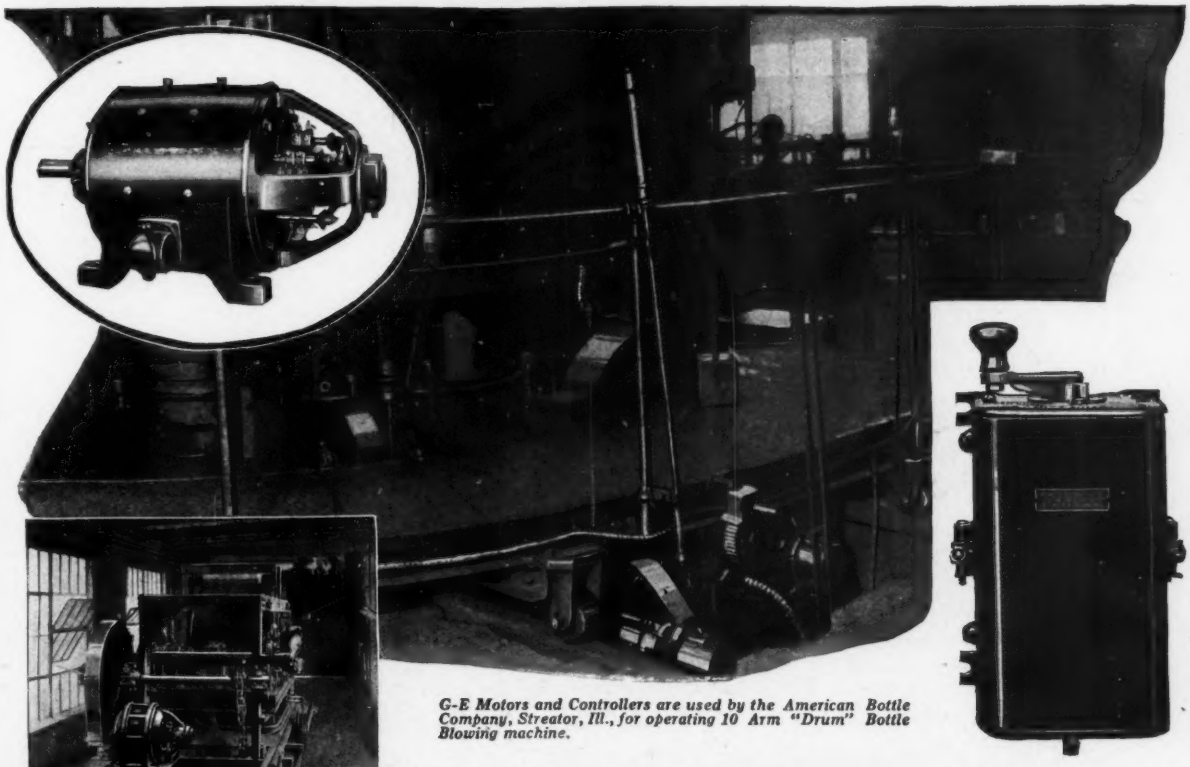
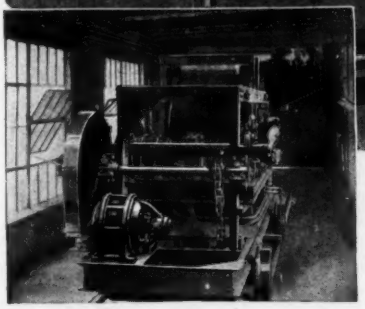
PYROMETERS

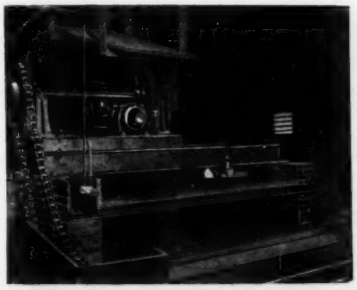
By the proper electrification of his machines, the glass manufacturer obtains the most improved methods of plant operation



G-E Motors and Controllers are used by the American Bottle Company, Streator, Ill., for operating 10 Arm "Drum" Bottle Blowing machine.



G-E Motors driving Mixing Car, Libbey Owens Sheet Glass Co., Charleston, W. Va.



G-E Motors provide for simple and accurate control of speeds in operating conveyor-type lehrs.

How G-E Motors Improve Your Plant

With G-E Motors throughout your plant—there are certainty, smoothness, and sustained speed in all operations; which mean immediate dollars saved, less wastage, and better and greater production for every hour's run.

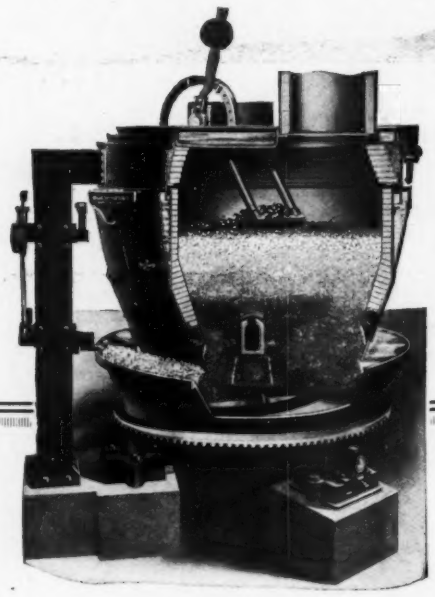
Specialists of the General Electric Company are experienced in the requirements of the glass industry—and will gladly cooperate with you in installing the proper G-E Motors and Controllers for the improved operation of your plant equipment.

General Electric Company

General Office Schenectady, N.Y.

Sales Offices in all large cities

43B-705



RELIABILITY is that supreme quality which out-values all others where continuous operation is imperative without delay or breakdown.

There is no apparatus in a glass plant where such reliable service is more essential than in the gas-making equipment, yet it is conspicuously lacking in most cases.

For Ten Years

The Morgan Pokerless Producer-Gas Machine

has been making firm friends wherever installed, principally by reason of its absolute reliability. It is the one exception to the general experience with Gas Producers in this respect.

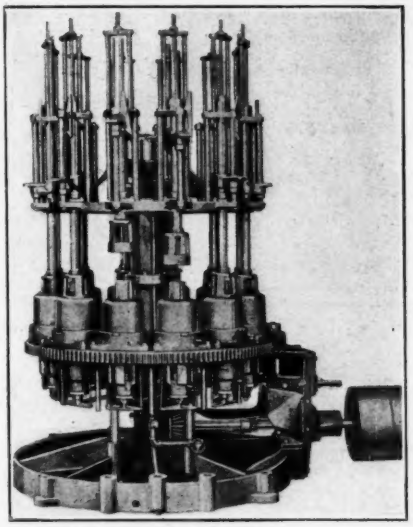
FIVE HUNDRED IN OPERATION

Morgan Construction Company

Worcester Massachusetts

Pittsburgh Office: 610 Magee Building

AUTOMATIC TUMBLER GRINDING MACHINE



Code name "Grinder"

Model "G" is designed for the grinding of all kinds of thin blown tumblers, stemware or other ware requiring a true edge.

Speed from 28 to 38 per minute.

This machine was designed to meet a long felt want of the trade and possesses rigidity and strength found in no other machine of like character.

Every convenience for facilitating quick work and simplicity of operation have been embodied in this design.

Manufactured by

MILLER MACHINE & MOLD WORKS

Cable address "EMILLER," Western Union Code

705-719 Ann Street — Columbus, Ohio, U. S. A.

FOERST FUEL OIL BURNERS

Why not become one of the satisfied users of our burners such as—

Peerless Glass Co., Long Island City, N. Y.
Maryland Glass Corporation, Baltimore, Md.
H. J. Heintz Co., Pittsburgh, Pa.

Eliminate Your Burner Troubles

Service, Plus Saving —Our Motto

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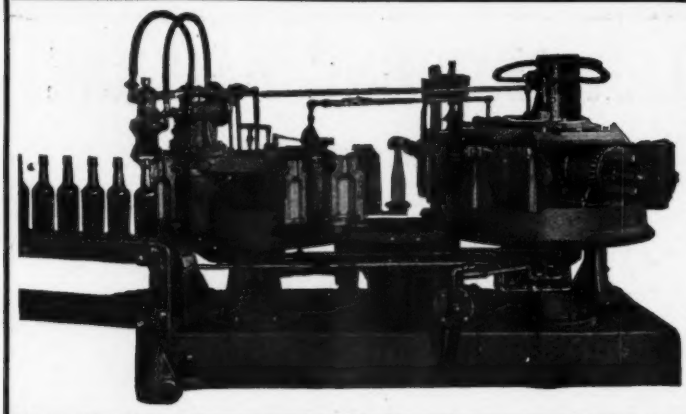
Representatives
Amsler-Morton Co.
Fulton Building
Pittsburgh, Pa.

JOHN FOERST & SONS

Fuel Oil Burner Manufacturers — Bayonne, N. J.



AUTOMATIC

Narrow Neck and Wide Mouth

Bottle Blowing Machines

Strictly Automatic When Operated With Mechanical Feeding Device

Can be Operated by Hand Gatherers

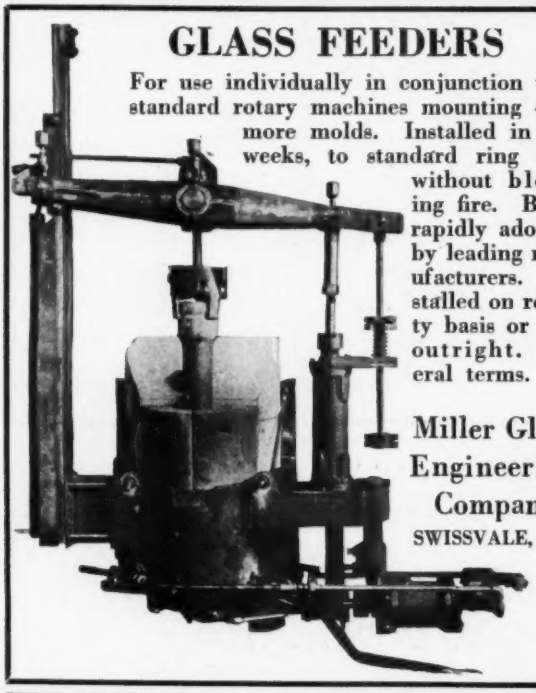
Speed 10 to 32 Bottles per minute, ranging in size from ½ oz. to Half-Gallon.

Lynch Glass Machinery Co.

Anderson, Ind. **U. S. A.**

Cable Address: "LYNCHNOBOY" Anderson.

Codes: A. B. C. Fifth Edition, Bentley's, Western Union



GLASS FEEDERS

For use individually in conjunction with standard rotary machines mounting 4 or more molds. Installed in two weeks, to standard ring hole without blocking fire. Being rapidly adopted by leading manufacturers. Installed on royalty basis or sold outright. Liberal terms.

Miller Glass Engineering Company

SWISSVALE, PA.

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? ? Why have we obtained some of the largest contracts in the industry? ? ?

? ? ? ? ? ? ? ? ? ? ? ? ? ?

McCamic - Batchell - Bergman Co.

GLASSHOUSE ENGINEERS and CONTRACTORS

TOLEDO, OHIO

SEND US YOUR INQUIRIES; CONSULT US

! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! !

! ! ! We have the experience, originality in design, our compensation for services rendered is always right and we give our work personal supervision. ! ! !

! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! ! !

When in need of

MOULDS

for

Bottles	Shades	Vases
Jars	Globes	Tableware
Tumblers	Lenses	Etc.

Write to

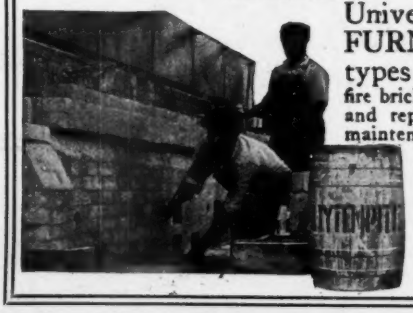
The Toledo Mould Company

Toledo, Ohio, U. S. A.

Cable Address: "Tomoco"

HYTEMPITE

Reg. U. S. Pat. Off.



Universally used in FURNACES of all types for laying up fire brick and for patches and repairs. Reduces maintenance by increasing life of brick work.

QUIGLEY

Furnace Specialties Co., Inc.

25 Day Street, New York

Agents in all industrial centers.

WE-FU-GO AND SCAIFE WATER

PURIFICATION SYSTEMS
SOFTENING & FILTRATION
FOR BOILER FEED AND
ALL INDUSTRIAL USES

WM. B. SCAIFE & SONS CO. PITTSBURGH, PA.

"PITTSBURGH"
Illuminating Glassware

S-828 J

Pittsburgh Lamp, Brass & Glass Co.
PITTSBURGH, PA.

Chemicals of Quality

to serve all divisions of the Glass Industry—

Mirror Manufacturers

Silver Nitrate
Ammonia
Tin Crystals
Denatured Alcohol
Muriatic Acid
Nitric Acid
Epsom Salt
Rochelle Salt

Chas. Cooper & Co.
Manufacturers Since 1857
194 Worth Street, New York
Works at Newark, N. J.

When buying advertising space, Quality, that priceless characteristic of all worth-while commodities and services, should be given greater consideration than price. The extra cost of quality is usually warranted by the results.

Johnston Brokerage Co.
Manufacturers
WINDOW GLASS
Incorporated Capital and Surplus $250,000
Selling Standard Brands—Carloads Only
First National Bank Building
Pittsburgh, Pa.

BRANCH OFFICES

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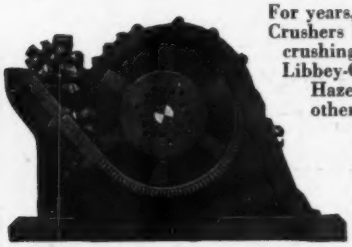
H. A. COLE, Western Agent, 916 Lumber Exchange Building, Chicago, Ill.
Kansas City Office, 1004 Commerce Building, Kansas City, Mo.
Philadelphia Office, Franklin Bank Building, Philadelphia, Pa.

CANADIAN OFFICES

Jos. Taylor & Son, Agents, 507 McKinnon Building, Toronto, Ont., Canada.
N. J. Dinnen & Co., Ltd., Winnipeg, Man., Canada.

Excellent Service—Best Quality—Large Capacity

Williams Glass Crushers



For years, Williams Hinged Hammer Crushers have been the standard for crushing glass in such plants as Libbey-Owens Sheet Glass Co., Hazel-Atlas Glass Co., and many others.

They reduce to 1", ½" or any fineness you wish without preliminary crushing. Size of crushed material also percentage of fine goods can be regulated to suit operator's wishes.

Write for details on a size for your use.

Williams Patent Crusher & Pulverizer Co.

803 Montgomery Street, St. Louis, Mo.

Chicago, 37 W. Van Buren St. — New York, 15 Park Row — San Francisco, 67 Second Street

FRINK DECOLORIZER AND FRINK ANTI-COLOR

replaces manganese or like products as a decolorizer. Try these Frink products—see what they will save you. Send for a copy of our booklet

"Frink Decolorizer and Anti-Color."

Prices quoted on request

Manufactured and sold by

THE FRINK DECOLORIZER CO.

Lancaster, Ohio U. S. A.

Foreign Representative, A. C. JACOBS,
11 Abercorn Place, London N. W. 8, England

SIMPLEX

Producer Gas Plants
Coal Handling Equipment
Power Plants
Glass House Machinery
Furnaces
Simplex Muffle Lehrs
Complete Factories
Labor Saving Devices

For Better Production

MAKING present installations efficient, economical, profitable is the work of our consulting engineers.

We also design, build and install glass house equipment. The plants we have served give ample testimony.

May we work with you?

Simplex Engineering Co.

Washington Trust Bldg. Washington, Pa.

"BEST—BY—TEST"

Is the Verdict Proven by Actual Experience

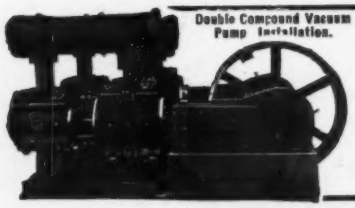
INSIST UPON HAVING

GRASSELLI'S PRIME REFINED—SALT—CAKE

The Grasselli Chemical Company

CLEVELAND, OHIO

New York City, 347 Madison Ave. — Guardian Bldg. — Chicago, Ill., 2101-35 Canalport Ave.



Double Compound Vacuum Pump Installation.

AIR COMPRESSORS and VACUUM PUMPS

Installations at
Hazel-Atlas Glass Co.
Macbeth Evans Glass Co.
Maryland Glass Corp.
Federal Glass Co.
Owens Bottle Co.
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BURY COMPRESSOR CO.
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J. W. Cruikshank Engineering Co.

230 Fifth Avenue Pittsburgh, Pa.

STRUCTURAL AND MECHANICAL ENGINEERS
for GLASS FACTORIES

READERS' WANTS

WANTED

MILLER FEEDER OPERATORS—Experienced feeder operators to install and also some to operate Miller feeders. None of our customers' employees need apply.

MILLER GLASS ENGINEERING CO.,
Swissvale, Pa.

WANTED—A GLASS HOUSE MANAGER
With Small Investment to Assure Good Faith

This is a splendid opportunity for the right man. Plant already built. Would also consider lease to bona fide party. South Florida is a splendid market for glass hollow-ware, aside from direct connection with Central America. Two furnaces can be kept busy day and night for Florida demands alone. Highest grade of silica sand and good line and fuel oil almost at our door at lowest prices possible. Only those with satisfactory experience need apply. Address:

TAMPA,
Care THE GLASS INDUSTRY, 50 Church St., New York.

Statement of the Ownership, Management, Circulation, etc., required by the Act of Congress of August 24, 1912, of THE GLASS INDUSTRY, published monthly, at New York, N. Y., for October 1, 1922. State of New York, County of New York—ss. Before me, a Notary Public, in and for the State and county aforesaid, personally appeared G. W. Cooper, who, having been duly sworn according to law, deposes and says that he is the managing editor of THE GLASS INDUSTRY, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 443, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business managers are: Publisher, Glass Industry Publishing Co., Inc., 50 Church St., New York; editor, J. B. Krak, 50 Church St., New York; managing editor, G. W. Cooper, 50 Church St., New York; business manager, G. W. Cooper, 50 Church, St., New York.

2. That the owners are (Give names and addresses of individual owners, or, if a corporation, give its name and the names and addresses of stockholders owning or holding 1 per cent or more of the total amount of stock): Glass Industry Publishing Co., Inc., 50 Church St., New York; L. J. Krom, 50 Church St., New York; G. W. Cooper, 50 Church St., New York; F. B. Krom, 60 Broadway, New York.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are (If there are none, so state): None.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him. G. W. COOPER, Managing Editor. Sworn to and subscribed before me this 29th day of September, 1922. [Seal] LAURA E. SMITH, Notary Public. (My commission expires March 30, 1923.)

WHAT ABOUT YOUR 1923 ADVERTISING?

Any concern with a reliable product to sell will find properly planned advertising a great help. But to be sure of reaching the largest number of good prospects, the publications to be used should be chosen with great care. The selection should be based, not on guesswork, habit, "hunches," or sentiment, but on accurate knowledge and common sense.

For reaching and influencing the buyers of glass factory equipment, raw materials and supplies, quite a number of well-known concerns including some of the most experienced, best informed and shrewdest advertisers in America decided, after thorough investigation, that THE GLASS INDUSTRY is the logical medium for covering the field, and have placed their advertising for the ensuing year exclusively in this journal, their reasons (equally applicable to your case) being that THE GLASS INDUSTRY is

—the paper that established a new editorial standard for glass trade publications and that is serving the industry with ability and fidelity, filling a long felt want.

—the paper that, solely on its merits, has won and held the hearty and practically unanimous approval, respect and confidence of the responsible men of the industry.

—the paper that *reaches at least 90% of the real "buying power" of the glass manufacturing industry*—not only the purchasing agents but also the men behind the purchasing agents—including the largest number of bona fide paid-in-advance subscribers among glass factory *department heads, superintendents, managers, chemists, engineers, owners, presidents, and other officials,* men who practically all have a hand in the specifying and buying of melting and annealing equipment, glass-working machinery, handling and conveying systems, refractories, pyrometers, chemicals, supplies and equipment of all kinds needed in this industry.

—and the paper that draws from its readers many favorable comments like those printed below, showing

What The Glass Manufacturers Think of THE GLASS INDUSTRY

(Original documents shown on request)

One of the largest pressed and blown ware manufacturing concerns in the world says:
"Your paper is the first that we have had relating to the glass trade that is really useful to the plant executive, and whose articles relate to the actual plant operations."

The manager of a big flint glass factory writes:
"I have never read any trade paper that serves its purpose any more fully.—Interesting from cover to cover."

From one of the largest bottle works in the world:
"Our object in wanting THE GLASS INDUSTRY is to keep informed as to developments in this business, and we believe your magazine covers the ground more fully than any we have been able to find."

An influential glass man says:
"Every issue is better than the preceding one. My only regret is that you do not issue twice a month or more."

A big manufacturer of illuminating ware:
"You are doing splendid work."

A well-known glass man:
"You head the list in your line."

From a California factory:
"A leader and sure winner."

From West Virginia:
"Your paper is doing splendidly. Keep up the good work."

An Indiana factory:
"Increasing its usefulness with every issue."

One of the leading and largest glassware manufacturers:
"Just keep on publishing as good a paper as you have in the past."

From an official of a modern New Jersey plant:
"Your magazine ought to be read by every employee in every glass manufacturing plant in the country, who is interested in his work, from the president down to the new recruit."

THE GLASS INDUSTRY is the journal which by all the accepted tests of experienced, intelligent advertisers, measures up in all respects to the requirements of the manufacturer or dealer who wants the most and best publicity he can obtain for his money.

Try It Out—You Will Not Be Sorry

THE GLASS INDUSTRY 50 CHURCH ST. NEW YORK

THE GLASS INDUSTRY CLASSIFIED BUYERS' GUIDE

FOR FURTHER INFORMATION, SEE ALPHABETICAL DIRECTORY OF ADVERTISERS AND CONSULT ADVERTISEMENTS

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Bury Compressor Company, Erie, Pa.
Cooper, C. & G., Co., Mt. Vernon, Ohio.
General Electric Co., Schenectady, N. Y.

ALUMINUM HYDRATE
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.

ALUMINUM OXIDE
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.

ALUMINUM SULPHATE
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.

ANNEALING FURNACES (See Lehrs)

ANTIMONY OXIDE
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.

ARSENIC
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.
Wiarda, John C., & Co., Brooklyn, N. Y.

AUTOMATIC BOTTLE MACHINERY (See Glass Working Machinery)

AUTOMATIC CONVEYORS AND LEHR FEEDERS
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.

AUTOMATIC GLASS FEEDERS (See Glass Feeders)

AUTOMATIC GLASS WORKING MACHINERY (See Glass Working Machinery)

BATCH HANDLING AND MIXING SYSTEMS
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.

BINS, STORAGE (See Storage Bins and Steel Bins)

BLOWERS, ROTARY
General Electric Co., Schenectady, N. Y.

BOILER FEED WATER PURIFICATION SYSTEMS
Scaife, Wm. B., & Sons Co., Pittsburgh, Pa.

BOILER INSULATION (See Insulating Brick)

BOND CLAY
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Quigley Furnace Specialties Co., New York.

BONE ASH
Wiarda, John C., & Co., Brooklyn, N. Y.

BORAX, POWDERED
Cooper, Charles, & Co., New York.

BOTTLE-MAKING MACHINERY (See Glass Working Machinery)

BRICK (See Insulating Brick, and Fire Brick)

BUILDING CONTRACTORS
Austin Co., Cleveland, O.

BURNERS (See also Gas Burners)
Oil
Foerst, John, & Sons, Bayonne, N. J.

CALCIUM PHOSPHATE
Cooper, Charles, & Co., New York.

CHEMICALS, GLASS-MAKERS'
Cooper, Charles, & Co., New York.
Drakenfeld, B. F., & Co., Inc., New York.
Frink Decolorizer Company, Lancaster, O.
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.
Pennsylvania Salt Manufacturing Co., Philadelphia, Pa.
Sharp-Schurtz Company, Lancaster O.
Wiarda, John C., & Co., Brooklyn, N. Y.

CHEMISTS, CONSULTING
Sharp-Schurtz Company, Lancaster, O.

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Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.
Wiederholdt Construction Co., 625 Bank of Commerce Bldg., St. Louis, Mo.

CHROME OXIDE
Cooper, Charles, & Co., New York.
Drakenfeld, B. F., & Co., Inc., New York.

CLAY (See Bond Clay, Fire Clay, Furnace Clay, Pot Clay)

CLAY POTS
Pittsburgh Clay Pot Co., Pittsburgh, Pa.
Pittsburgh Plate Glass Co., Refractories Dept., Pittsburgh, Pa.
Willetts Company, The, Pittsburgh, Pa.

COAL HANDLING AND STORAGE SYSTEMS
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.

COBALT OXIDE
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.

CONTRACTORS
Building
Austin Co., Cleveland, O.
Glass Factory, Furnace Construction and Repairs
Amsler-Morton Company, The, Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
McCamic-Batchell-Bergman Co., Box 6, Station G, Toledo, Ohio.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.

COPPERAS
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.

COPPER OXIDE, BLACK
Harshaw, Fuller & Goodwin Co., The, Cleveland, O.

CRYOLITE (See Kryolith)

CRUSHERS AND PULVERIZERS
Glass, Coal, etc.
Williams Patent Crusher & Pulverizer Co., St. Louis, Mo.

DECOLORIZERS
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Frink Decolorizer Company, Lancaster, O.
Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.
Sharp-Schurtz Company, Lancaster, O.

DECORATING MATERIALS, GLASS (See Glass Decorating Materials)

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Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.
Wiederholdt Construction Co., 625 Bank of Commerce Bldg., St. Louis, Mo.
Factory Buildings
Austin Co., Cleveland, O.
Fuel and Furnace
Amsler-Morton Company, The, Pittsburgh, Pa.
Chapman Engineering Co., Mt Vernon, Ohio.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
McCamic-Batchell-Bergman Co., Box 6, Station G, Toledo, O.
Sharp-Schurtz Company, Lancaster, O.
Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.
Furnace, Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Glass Factory
Amsler-Morton Company, The, Pittsburgh, Pa.
Cruikshank, J. W., Engineering Co., 230 Fifth Ave., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
McCamic-Batchell-Bergman Co., Box 6, Station G, Toledo, Ohio.
Sharp-Schurtz Company, Lancaster, O.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.
Mechanical
Cruikshank, J. W., Engineering Co., 230 Fifth Ave., Pittsburgh, Pa.
Oil Burning
Foerst, John, & Sons, Bayonne, N. J.
Plate Glass Factory
Amsler-Morton Company, The, Pittsburgh, Pa.
Cruikshank, J. W., Engineering Co., 230 Fifth Ave., Pittsburgh, Pa.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
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Amsler-Morton Company, The, Pittsburgh, Pa.
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Dixon, H. L., Co., Box 140, Pittsburgh, Pa.
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Simplex Engineering Co., Washington Trust Bldg., Washington, Pa.

ENGINES
Gas and Corliss
Cooper, C. & G., Co., Mt. Vernon, Ohio.

ELECTRIC FURNACES (See Furnaces)

FEEDERS, AUTOMATIC GLASS (See Glass Feeders)

FELDSPAR
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., The, Cleveland O.
Wiarda, John C., & Co., Brooklyn, N. Y.

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Chapman Engineering Co. Division, Mt. Vernon, Ohio.
Dixon, H. L., Co., Box 140, Pittsburgh, Pa.

FLUORSPAR
Harshaw, Fuller & Goodwin Co., Cleveland, O.

FUEL ENGINEERS (See Engineering Service)

FURNACE ENGINEERS (See Engineers)

FURNACE INSULATION (See Insulating Brick)

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McCamic-Batchell-Bergman Co., Box 6, Station G, Toledo, Ohio.

FURNACES
Annealing (See Lehrs)
Electric
General Electric Co., Schenectady, N. Y.
Westinghouse Electric & Mfg. Co., East Pittsburgh, Pa.
Tank and Pot
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Because they have maintained high standards of business practice, many of the advertisers listed here have become leaders in their respective lines.

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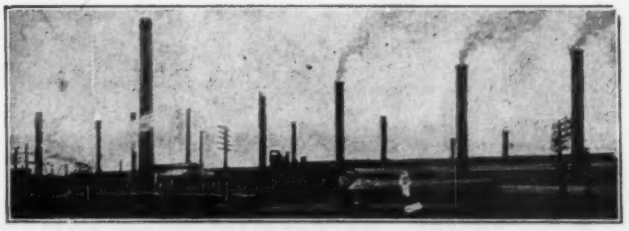

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We are pleased to announce that we have perfected a new

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We shall be glad to send you full particulars of this new machine upon request.

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DEC 8 1922

The Glass Industry

REG. U. S. PAT. OFF.

The First Technical Trade Journal Devoted Primarily to Glass Technology, Engineering, Raw Materials and Glass Factory Equipment and Operation

GLASS INDUSTRY PUBLISHING CO., INC.
50 CHURCH STREET, NEW YORK

PUBLISHED MONTHLY. $2.00 A YEAR
SINGLE COPY 20 CENTS

Vol. 3. NEW YORK, DECEMBER, 1922 No. 12

FOR THE HARDEST USAGE

A SUPERINTENDENT told us that in looking into our instruments he thought they were too good to put out in a dusty, dirty furnace room. But it was not hard to convince him to put them there. That is what they are built for.

They are beautiful instruments, both the indicators and recorders, *but* they have not been beautified except in the sense that they are well made. They are simple in design, sturdy in structure, appropriate in type and made as finely as astronomical instruments are made. The instrument parts are splendid specimens of fine instrument work, and so that this work may be durable and permanent, it is done in brass, aluminum and bronze.

They will stand rougher, harder usage than any other pyrometers made.

WILSON-MAEULEN CO., INC.

385 CONCORD AVENUE, NEW YORK

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"It Really is Continuous"

Continuous Coal Feed, Agitation and Ash Removal.

"We Move the Parts That Do the Work."

Chapman Continuous Gas Producer

For five years we've "moved the parts that do the work." Our Continuous ash removal is on this same principle.

The three steps in producer gas making—coal feeding, agitation and ash removal—all progress continuously (not intermittently) in the Chapman Continuous Gas Producer. This means uniformity in the fire bed, which produces the uniformly rich gas so necessary to fuel economy.

The massive shell with its several tons of fire brick is stationary, so is the ash pan, for only those parts move that do effective work. The Agitator Bar and Ashing Arm are entirely independent and the speed of each can readily be adjusted to harmonize with the other.

A letter from you will bring complete information on Chapman Gas Machinery and Engineering Service.

THE CHAPMAN ENGINEERING COMPANY

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Allied with

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50 Church Street, New York

Oliver Building, Pittsburgh, Pa.

THE GLASS INDUSTRY, Vol. 3, No. 12, December, 1922. Published Monthly by Glass Industry Publishing Company, Inc., 50 Church St., New York, U.S.A. $2.00 a year. Single copy, 20 cents. Entered as second-class matter August 10, 1921, at the Post office at New York, N. Y., under the act of March 3, 1879.

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Dixon Tank Furnaces are constructed in accordance with the best glass factory practice. Every feature and detail has been proven practical, substantial and efficient. They are always built of the best material obtainable, by skilled workmen and are guaranteed to give entire satisfaction.

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Our engineering department is at your service always.

H. L. DIXON COMPANY

"Everything for the Glasshouse"

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Office and Works—Carnegie, Pa.

Crystal Silica Glass Sand

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It is shipped dry in paper-lined box cars.

Every carlot is like every other carlot, year in and year out, giving the glassmaker the advantage of dealing with a **known quantity** in every batch.

Try one shipment.

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Amco Type Continuous Muffle Lehrs

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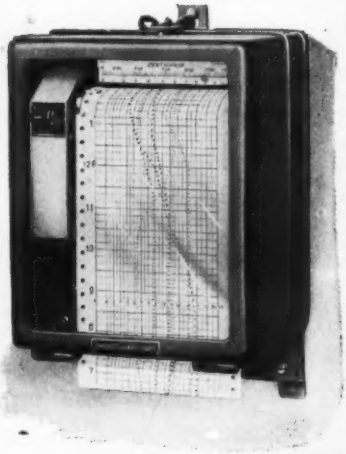

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are standard equipment in many glass houses. This is not surprising as our thermocouples stand from 18 months' to two years' continuous service in tank furnaces and our instruments are friction-less. You get maximum service and minimum maintenance costs.

ENGELHARD PYROMETERS ARE GOOD PYROMETERS TO STANDARDIZE ON

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Austin Engineers are prepared to deliver buildings that will be designed to *exactly suit your needs,* buildings that will be low in cost and high in efficiency, because Austin engineers have had many years' experience in the glass industry.

No matter what your building requirements may be, Austin can furnish you a building on a guaranteed schedule time basis.

The Austin Company has not only built for many manufacturers in the Glass Industry but has executed repeat contracts for a number of its clients. Besides designing extensive new plant additions for the main works of Pilkington Bros., Ltd., Austin has designed, built and equipped a complete plant with extensive housing facilities at Thorold, Ont., and for this large international concern, Austin also rebuilt a mammoth glass plant at Maubeuge, France, which was destroyed during the great war.

Austin engineers are prepared to design, build and equip complete glass plants, plant extensions and modifications with speed and economy. Consultation involves no obligation. Phone, wire or use the coupon.

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Engineers and Builders of Modern Glass Plants

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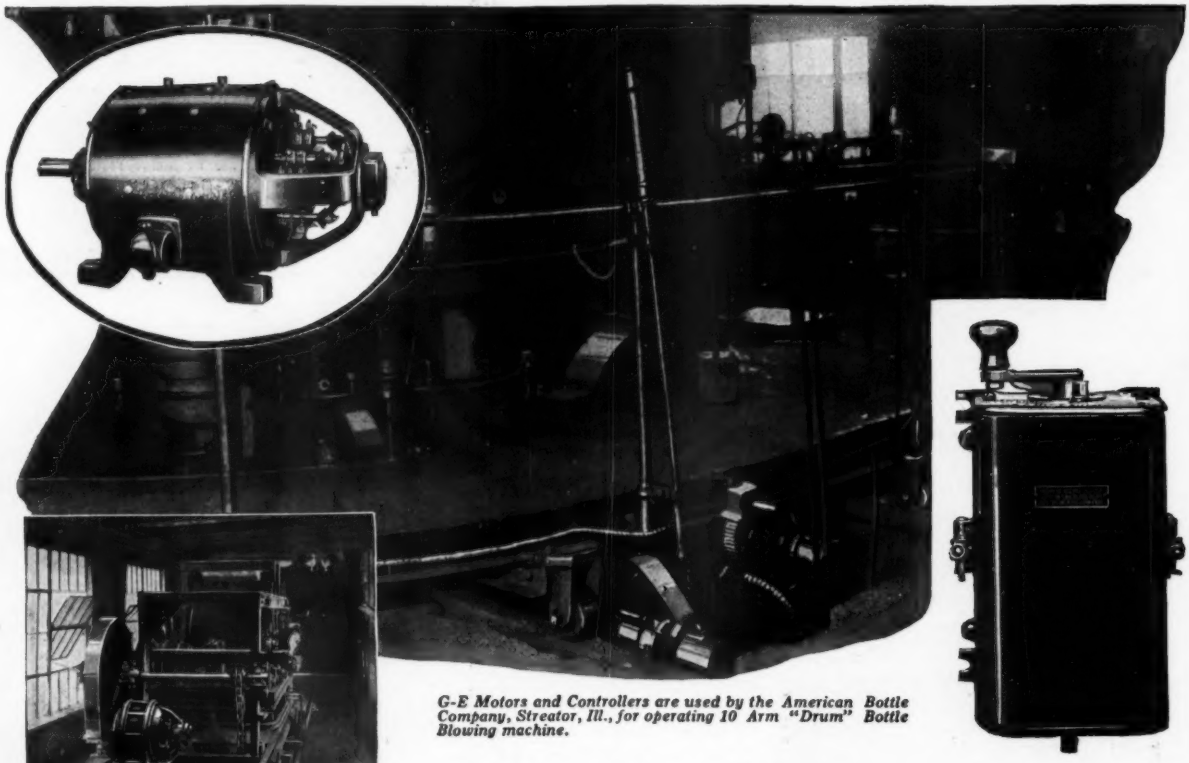

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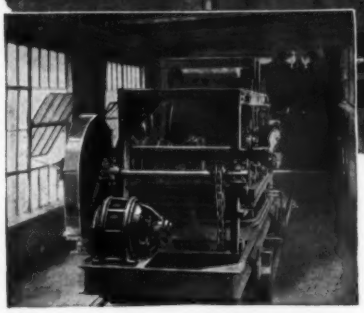
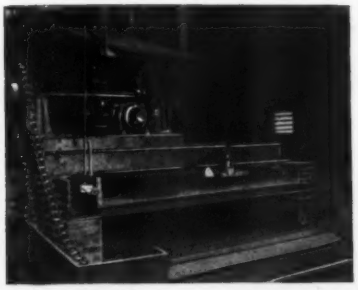


G-E Motors driving Mixing Car, Libbey Owens Sheet Glass Co., Charleston, W. Va.



G-E Motors provide for simple and accurate control of speeds in operating conveyor-type lehrs.

How G-E Motors Improve Your Plant

With G-E Motors throughout your plant—there are certainty, smoothness, and sustained speed in all operations; which mean immediate dollars saved, less wastage, and better and greater production for every hour's run.

Specialists of the General Electric Company are experienced in the requirements of the glass industry—and will gladly cooperate with you in installing the proper G-E Motors and Controllers for the improved operation of your plant equipment.

General Electric Company

General Office Schenectady, N.Y.

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or services to the glass factories at large, here or abroad, where can you find a periodical so suitable and with such potency for the accomplishment of your purpose, as THE GLASS INDUSTRY?

Its regular readers are the identical men who buy the bulk of the glass-making materials and equipment used in the industry.

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THE GLASS INDUSTRY

19 Liberty Street **New York**

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(4th of a series)

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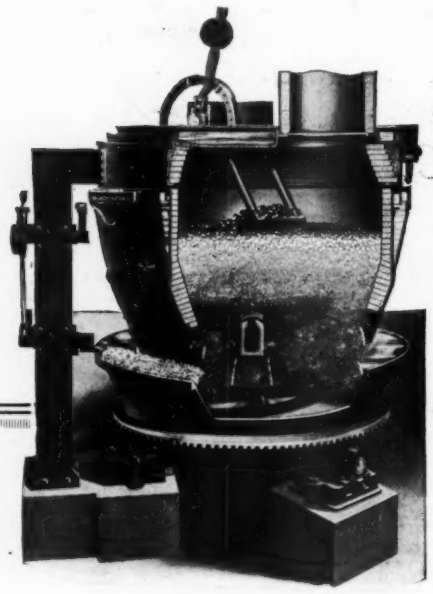
Most used in the world



RELIABILITY is that supreme quality which out-values all others where continuous operation is imperative without delay or breakdown.

There is no apparatus in a glass plant where such reliable service is more essential than in the gas-making equipment, yet it is conspicuously lacking in most cases.

For Ten Years

The Morgan Pokerless Producer-Gas Machine

has been making firm friends wherever installed, principally by reason of its absolute reliability. It is the one exception to the general experience with Gas Producers in this respect.

FIVE HUNDRED IN OPERATION

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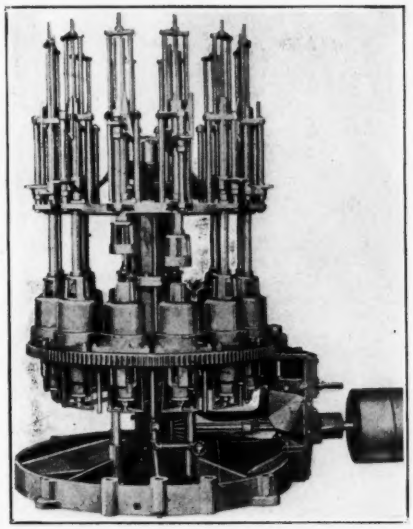
Worcester Massachusetts

Pittsburgh Office: 610 Magee Building

AUTOMATIC TUMBLER GRINDING MACHINE



Code name "Grinder"

Model "G" is designed for the grinding of all kinds of thin blown tumblers, stemware or other ware requiring a true edge.

Speed from 28 to 36 per minute.

This machine was designed to meet a long felt want of the trade and possesses rigidity and strength found in no other machine of like character.

Every convenience for facilitating quick work and simplicity of operation have been embodied in this design.

Manufactured by

MILLER MACHINE & MOLD WORKS

Cable address "EMILLER," Western Union Code

705-719 Ann Street Columbus, Ohio, U. S. A.

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FUEL OIL

BURNERS

Why not try one of our burners?

Made in sizes to meet the requirements of

CONTINUOUS TANKS, DAY TANKS, POT FURNACES, LEHRS, GLORY-HOLES

Eliminate the leakage nuisance.

Simplicity of construction. Utility and price, outstanding features.

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For Immediate Occupancy—Fully Equipped

Built in March, 1919 **In Excellent Condition**

The best investment for one contemplating the glass manufacturing field—or as an addition to an inadequately sized glass factory.

Located within easy access of the Pocahontas, Chesapeake & Ohio coal fields and within reach of an abundance of intelligent labor, both white and colored, male or female.

Plant consists of a main building, batch house, power house, producer house, box shop, ware shed, office building, oil tank and full equipment for immediate possession. The grounds, containing 5.072 acres, connected by a siding with the Southern Railway main line.

Location

The Lynchburg Glass Works, located at Lynchburg, Va., on the main line of three prominent railroads:—the Chesapeake & Ohio Railroad from Newport News to Cincinnati, Ohio; the Southern Railroad from Washington, D. C. to Atlanta, Ga., the Norfolk & Western Railroad from Norfolk, Va., to Toledo, Ohio.

Good transportation service and quick access to the more important eastern cities is shown by the following mileage tabulation:—

	Miles
Distance from Lynchburg to Norfolk, Va.	204
Distance from Lynchburg to Washington, D. C.	174
Distance from Lynchburg to New York City	400
Distance from Lynchburg to Philadelphia, Pa.	310
Distance from Lynchburg to Baltimore, Md.	220
Distance from Lynchburg to Richmond, Va.	150
Distance from Lynchburg to Petersburg, Va.	123
Distance from Lynchburg to Atlanta, Ga.	474
Distance from Lynchburg to Charlotte, N. C.	200
Distance from Lynchburg to Greensboro, N. C.	115
Distance from Lynchburg to Roanoke, Va.	56

Plant Embraces 5.072 Acres and Consists of

Office Building

Five room, two story building. Contains all necessary furniture for immediate occupancy. Equipment includes two iron safes.

Main Building

198x100 feet, two stories high. First floor is strongly built with concrete walls; flooring; and with concrete reenforcements between and back of furnaces.

Batch House

55x45 feet, two stories high. Equipped with three bins, running from ground floor, through second floor to roof, for storing soda ash, lime and sand. A car trestle has been built to facilitate unloading direct to top of bin. Automatic batch mixer is located on second floor. Material is assembled and weighed on first floor and conveyed by machinery to batch mixer, back of furnaces.

Power House

50x37 feet, sturdy frame construction with iron siding and roof, contains boilers, compressors and pumps.

Producer House

64x37 feet, brick construction with iron roof. Second floor reenforced with concrete, is on a direct lineage with bottom of coal dump and top of producers.

Box Shop

38x30 feet. Fully equipped with all necessary machinery, including cut-out and rip saws, for manufacturing boxes and shipping crates and cases as needed.

Ware Shed

80x48 feet. Adequately built under one roof to facilitate carting of finished ware from packing room to shed.

Oil Storage

Twenty-two thousand gallon capacity oil tank, filled direct from tank cars.

Smaller Shops

Two other well equipped shops provide ample provision for all necessities—a Machine Shop, completely outfitted for repairing and manufacturing moulds, and a Blacksmith Shop with all the necessary equipment.

Equipment of Plant

Two Furnaces with daily capacity of 22 and 28 tons, respectively. Eight rings each. Continuous gas-fired. One Beckwith Machinery Co. Automatic Batch Mixer, electric driven.

Two 66 inch by 18 feet Horizontal Return Tubular Boilers, complete with feed pump and water heater.

One 12x14x12 steam-driven Duplex Air Compressor.

One 14x16x14 Duplex Air Compressor, steam driven, complete with storage and regulator tanks.

One Oil Pump and Stand Pipe.

Four Cox Gas Producers, all complete.

One W. J. Miller 5-Mould Jelly Glass Machine.

One O'Neill No. 30 Automatic Bottle Blowing Machine.

Five Cox Semi-Automatic Bottle Blowing Machines. (One of these Cox Semi-Automatic Machines and the O'Neill No. 30 Machine were operated in connection with a Howard Automatic Glass Feeder.)

Two Fans, with complete cooling system.

Equipment, including Glory Holes, for operation of one tank with Hand Shops.

Five Oil-fired Annealing Lehrs, 65 feet long, having tunnels 7 feet wide.

Prescription Moulds for both hand and machine, from ½ to 32 ounces.

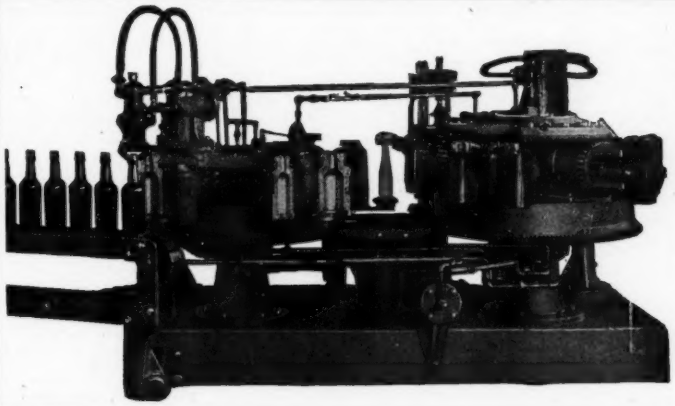
Moulds for assortment of Round, Square, Panel and Proprietary Medicine bottles, and a general line of Soda bottles, including Coca-Cola.

Fans, Box Shop, Batch Mixer and Machine Shop are operated with motors.

One 15 H. P. Generator for lighting.

Other miscellaneous equipment for making this a completely outfitted glass plant.

For further information, price and terms, address John Victor, Chairman Creditors' Committee, Lynchburg, Va.



AUTOMATIC

Narrow Neck and Wide Mouth

Bottle Blowing Machines

Strictly Automatic When Operated With Mechanical Feeding Device

Can be Operated by Hand Gatherers

Speed 10 to 32 Bottles per minute, ranging in size from ½ oz. to Half-Gallon.

Lynch Glass Machinery Co.

Anderson, Ind. **U. S. A.**

Cable Address: "LYNCHNOBOY" Anderson.

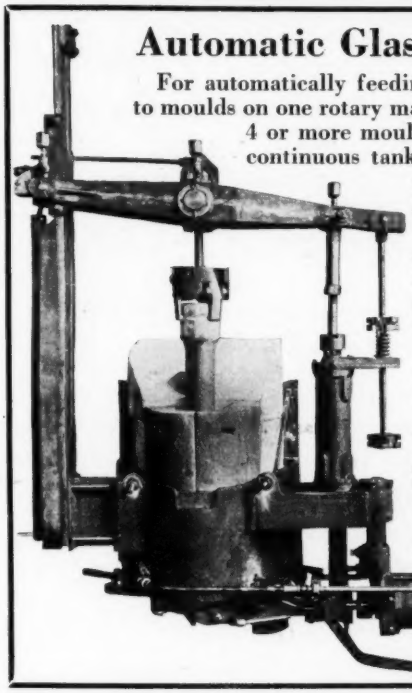
Codes: A. B. C. Fifth Edition, Bentley's, Western Union

Automatic Glass Feeder

For automatically feeding gobs of glass to moulds on one rotary machine mounting 4 or more moulds. Installed to continuous tank ring hole in 2 weeks without blocking fire.

Eliminate skilled manual labor, increase production and reduce costs.

Furnished on royalty basis or sold outright.



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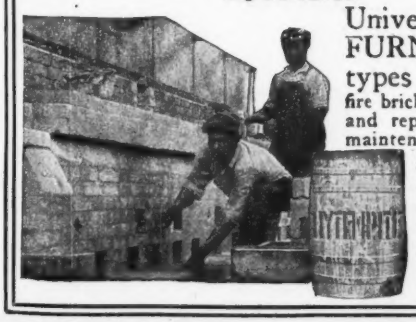

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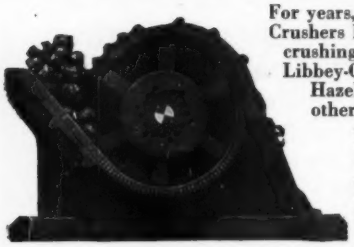
Williams Glass Crushers



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They reduce to 1", ½" or any fineness you wish without preliminary crushing. Size of crushed material also percentage of fine goods can be regulated to suit operator's wishes.

Write for details on a size for your use.

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replaces manganese or like products as a decolorizer. Try these Frink products—see what they will save you. Send for a copy of our booklet

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MILLER FEEDER OPERATORS—Experienced feeder operators to install and also some to operate Miller feeders. None of our customers' employees need apply.

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With Small Investment to Assure Good Faith

This is a splendid opportunity for the right man. Plant already built. Would also consider lease to bona fide party. South Florida is a splendid market for glass hollow-ware, aside from direct connection with Central America. Two furnaces can be kept busy day and night for Florida demands alone. Highest grade of silica sand and good line and fuel oil almost at our door at lowest prices possible. Only those with satisfactory experience need apply. Address:

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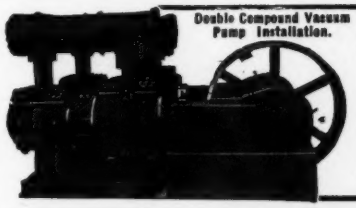

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O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., The, Albany Works, Trenmar Gardens, Willesden Junction, London, N. W. 10, England.

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IRON CHLORIDE SOLUTION
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KRYOLITH
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LEHR FEEDERS (See Automatic Conveyors and Lehr Feeders)

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Simplex Engineering Co., Washington Trust Building, Washington, Pa.

LEPIDOLITE
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LITHARGE
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MOLDS, MACHINE AND HAND
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Miller Machine & Mold Works, Columbus, Ohio.
O'Neill Machine Co., The, Toledo, Ohio.
O'Neill Machine Co., The, Albany Works, Trenmar Gardens, Willesden Junction, London, N. W. 10, England.
Toledo Mould Co., Factories Building, Toledo Ohio.

MOTORS, ELECTRIC
General Electric Co., Schenectady, N. Y.

MULTI-RECORDING PYROMETERS (See Pyrometers)

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Cooper, Charles, & Co., New York.
Drakenfeld, B. F., & Co., Inc., New York.
Harshaw, Fuller & Goodwin Co., The, Cleveland, Ohio.
Sharp-Schurtz Company, Lancaster, O.

POWER PLANTS
Cooper Co., The C. & G., Mt. Vernon, O.
Simplex Engineering Co., Washington Trust Building, Washington, Pa.
Wiederholt Construction Co., 625 Bank of Commerce Bldg., St. Louis, Mo.

PRODUCER GAS PLANTS (See also Fuel Gas Plants)
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Morgan Construction Company, Worcester, Mass.
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Pittsburgh Clay Pot Co., Pittsburgh, Pa.
Willetts Company, The, Pittsburgh, Pa.

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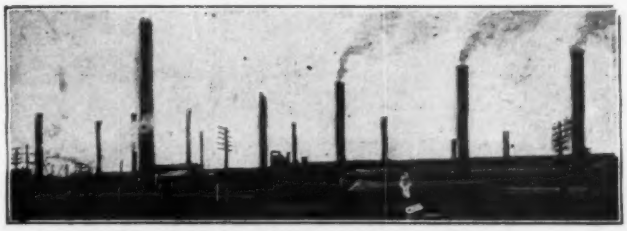

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